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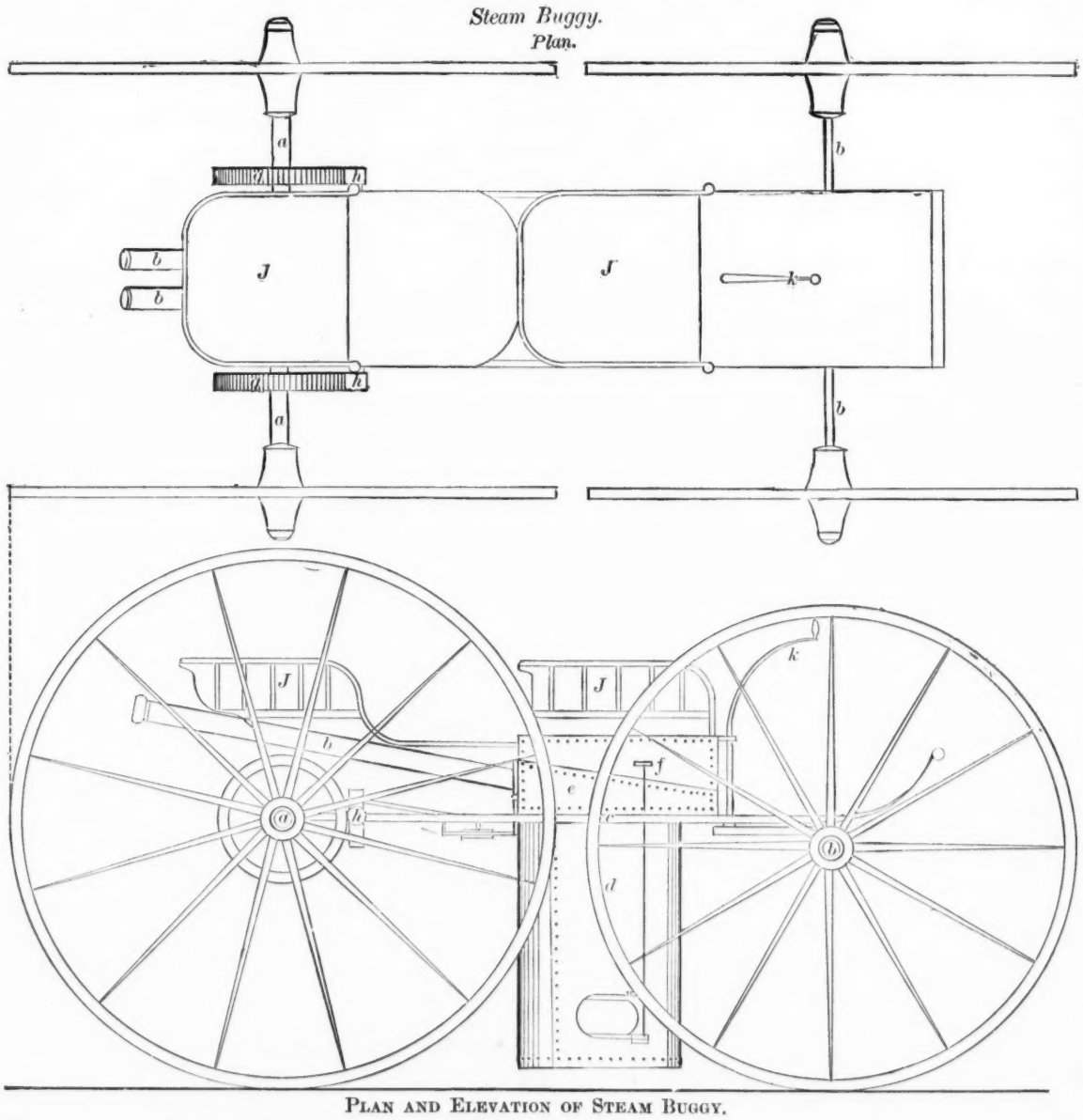
A Modern Steam Buggy.

BY F. G. WOODWARD.

The annexed sketch is a good illustration of a small steam carriage, which may be seen occasionally trundling about along the pleasant drives in the vicinity of Boston. The builder of the machine has made several practical pleasure carriages of this class, all differing somewhat in their general "make up;" but this one is the most satisfactorily arranged, I think, of any I have seen. The two axles *a*, *b*, are united by two straight parallel steel rods *e*, their forward ends being fixed to a short steel bar, which carries a king bolt, upon which the axle swivels. The boiler *D* is suspended beneath these bars; the smoke box *e*, and the tank *f*, are placed directly above the boiler, as shown; the two cylinders (not seen) lie horizontally on the top of the boiler in the smoke box; the crank shaft lies under the rear seat *J*, and carries two equal pinions *h*, which work two equal gears *g*, fixed to the drivers. Steering is effected by the trundle *k*, having a pinion on its lower end, which works a circular rack *i*, attached to the forward axle; *l l* are two smoke pipes.

Steam Buggy.
Plan.



PLAN AND ELEVATION OF STEAM BUGGY.

It will be seen that the arrangement is quite simple and direct. Such pleasure carriages, carrying only one or two persons, are mere playthings, of course; nevertheless, they show a degree of careful thought, good proportion and workmanship, which, if applied to larger machines, might be productive of profitable results.

The working of steam vehicles on our public roads, indiscriminately, can never be made profitable; but there are many sections of level road in the vicinity of some of our business centers where a system of "self-propellers" might be profitably established. Let steam carriages be as finely proportioned, and as thoroughly made, as our best modern wagons and coaches, and then confine their operation strictly to even, hard-surfaced roads, like our best "drives"—grade nowhere exceeding eighty feet to the mile—and their success would be assured.

The autumn industrial exhibitions do not attract as much attention from the press this year as they usually do. This is undoubtedly owing to the extra activity of manufacturing industries, rendering it difficult to induce former exhibitors to devote any time to getting up displays, as well as to the excitement of a political campaign. All the exhibitions, however, have been well attended, and, so far as we can learn, have proved successful.

Extracts from Chordal's Letters.

Mr. Editor:—

* * * * I find myself inquiring still further into that vague and indefinite thing known as the custom of the trade, or, to put it in other words, the law of the shop. Many months ago, in one of my letters, I asked if any machine man had ever been lucky enough to find out to whom belonged photographic negatives which he had paid for. I also asked if any machine man had been plucky enough to tell a patron, who patterns belonged to, after the said patron had paid for them. Again, I asked, what could be done with a foundryman who takes your order to make a thing at most a half inch thick, he to furnish pattern, at five cents per pound, and then delivers it three quarters thick, saying it couldn't be cast any thinner; a statement which he disproves the next heat by casting one three-eighths thick. I have also asked what to do with the foundryman who sends me castings with the core prints cast on, instead of cores being set, when I do fifty dollars worth of work on the castings before finding out the blunder. And I have asked what the foundryman was to do with the machine man who refuses to pay for good solid castings, made from patterns furnished, simply because they broke when put in place. Again, I have asked about the machine man who estimates that a job will come to six hundred dollars, and, after making a contract at so much per day for labor, and so much per pound for stock, does the job, and brings in a true and correct bill to his victim for twelve hundred dollars.

* * * * Now, I ask questions relating to a more common and complicated matter.

I refer to common job work in the common jobbing shop where, work is done by the day for labor and by the pound for material.

When a man takes a job to a machine shop he expects to have it done, and to pay for it as per agreement. But when the bill is made to include every little item of mismanagement and miscalculation and botching and re-doing, there certainly is some justification for kicking.

* * * * Case number one: I contracted with a shop to build me a piston head for a steam engine. The shop had the reputation of being a good one, and their prices were not especially low.

The contract was: I to pay fifty cents an hour for pattern work, forty cents an hour for machine work, and six cents a pound for castings.

This was all right and reasonable in a contract, but I thought I had cause to grumble at the bill resulting from this contract. The pattern maker made his patterns; the patterns went into the sand; and the castings went into the lathe. After a while it was found that everything was wrong. The castings had to go into the scrap pile; the pattern maker had to make new patterns; new castings were got, and a lot of lathe work had to be done over. When the thing was about done some lunkhead had to maul a big piece out of the spider flange, and the spider went into the scrap pile, and the pattern went into the sand again, and the casting went into the lathe again, and—I believe that was all, except that I had to pay for all that pattern work, and all that machine work, and all those castings, less a generous credit of one cent per pound for one wrong set of castings and one damaged spider casting.

* * * * What hurts me about such a bill is the fact that no one is specially benefited by the special bigness of the bill.

When somebody is ready to pay a big bill, I like to see somebody get a big profit out of it.

In this case I got no better job that I could get for a legitimate price, and the makers of the bill made no more money than they would make on a similar amount of legitimate work. There is some benefit to be derived from a swindle, but none can be got out of an expensive bungle unless you have the bungling experience yourself. In the above case, I paid the bill for the bungle, and the other party got the cash and the free experience.

* * * * The above case represents regular shop practice where open contracts are made. The justness of such a bill is based on the fact that the sufferer employs the talents of the contracting party, and has to take them for better or for worse. This puts the contracting shop in the position of an irresponsible agent between the workman and the patron.

* * * * The bungling shop establishes a bungling reputation, and in course of time has to yield to more reliable rivals; but I want to know where on earth to find the shop so well managed that, just such blunders, as cited above, don't occur every week. Many of these things are never dreamed of by the patron; many are never known of by the proprietors. Many are never heard of by the foreman. The workman is given a piece with instructions to put a hole in it at a certain place. He does so, and brings in a time card for "Putting hole in old piece:—three hours." If the time card was itemized it might read as follows: Putting wrong-sized hole in wrong place by wrong means, in old piece:—one hour. Plugging the blun-

der in old piece:—one hour and a half. Putting proper sized hole in proper place by proper means in old piece:—half an hour. Total time on old piece:—three hours.

* * * * The lamentable feature of industry is that qualities of reliability don't receive much recognition.

If I had submitted my piston job to two different parties for figures on such a contract as I did make, is it at all likely that I would have given it to the party whose price was the highest, on such party's statement that he was a good manager and could get the job out for me at a low price? Not much.

We generally judge of a man's good management by his ability to work low. As a matter of fact my piston job would have cost me less if I contracted for by a better man at a higher price. When we look at these things we form good resolutions to deal only with good reliable prudent certain men when we make open contracts in the future; and we decide that such qualities are cheap in the end, even if they are a little above the running price. And then when our ideal man makes a blunder we find that it is a high priced blunder; our good resolution fails; and we decide in the future to get our blundering done in the cheapest shop.

* * * * With workmen in the shop the thing works just the same. We pay two men two dollars and a half a day each, and see that one man is constantly bungling and fussing over work which is, maybe, tip-top when he gets done with it, but which is enormously expensive all the time; but still we cannot strike a pro rata of value and pay the other man his proper value, which we know to be far above that of the bungling man. The men won't have it.

* * * * For a first class sample of a silly fool, give me the mechanic who will work for two dollars a day when he sees, by comparing his own labor with that of others around him, that he is worth three dollars a day; and who, when the idea strikes him, gets half a dozen of the chaps who he knows are over-paid already, and taking the six with him, goes to the suffering powers that be, and says he thinks "WE ain't getting wages enough."

If this mutton-head had any sense he would see that WE was getting more that WE are worth, while *I* was getting less than *I* was worth. When *I* goes to the paying parties, knowing that *I's* work is not as well paid for in proportion as the labor of the aforesaid WE'S, the *I* can in most every case get perfect satisfaction, unless he has the reputation of being a blab, who takes delight in bragging to the over paid men.

* * * * When will the workmen of this intelligent land learn that they have something to sell, which, in times of fair prosperity, will bring its full value if put upon its merits; but which, if put in with chaff, will bring the price of chaff.

* * * * If you have good potatoes to sell, see that you get their value. You cannot mix one bushel of good potatoes with ten bushels of poor ones, and then expect to get the price of good ones for the whole lot. The thing would be a swindle, based on the presumption that potato buyers were fools; and the result would be that the bushel of good potatoes would have to be satisfied to bring the price of poor ones.

If some good machinists, whom I happen to know, had half the eyes potatoes have, they would not talk so much about the low pay which we poor potatoes bring.

* * * * Back to shop law again. Case Number Two. Smith takes some sort of a rigamajig to a shop to have it repaired. The job ought to be worth about eight dollars. The inevitable bungler breaks it and the total repair bill is forty dollars.

* * * * Case Number Three, with a possible suggestion of justice. Man takes a fine mirror to a glazier to have it cut two inches shorter. Man says to glazier, "Be very careful. That's a costly piece of glass. If you break it you will have to pay me seventy-five dollars." Glazier cuts the end off in two seconds, and without damaging the glass. He charges Mr. Man ten dollars. Ten cents for doing the work, and nine dollars and ninety cents for the heavy risk incurred.

* * * * Case Number Four. Man broke his dog's leg and went to a surgeon to have it fixed. Surgeon was a good surgeon and a bungler. He fixed the broken leg all right, but he broke two more while he was doing it, and, like the machine man, he brings in a bill for mending three broken legs.

* * * * Case Number Five. Man takes a watch to be fixed. Needs new main spring. Contracts with watchmaker at three dollars. Watchmaker puts the spring in all right and then drops the watch and tramps on it and wrecks it so it ain't worth five cents, and then, like the machine man, brings in a bill for putting in the mainspring.

* * * * Case Number Six. When Machinist comes to settle with a certain railroad shop he finds himself docked eight dollars for broken tools, when he receives not one cent for risks assumed on Company tools. He is credited with labor at the price of labor, with no risks assumed. He has to sue for his money, and he gets it—every time.

* * * * Very respectfully,

CHORDAL.

Shop Kinks, No. 2.

BY L. F. LYNE, M. E.

In most of the machine shops in this country it is customary where a number of holes are to be counter-bored, for the reception of flat-headed screws or bolts, to make a special tool for that purpose. This tool is generally made of a single piece of rectangular steel, having a solid, turned end, which fits the hole to be counter-bored. The principal objections to this style of tool is that it can only be used to fit a certain sized hole, and will do for no other. The writer adopted a simple plan, a few years since, which is illustrated by the accompanying engraving. It represents a counter-bore *a*, which is made in the usual way with this exception: The end *d*, is smaller than upon that usually adopted; supposing the diameter of *a*, to be 1½ inch the diameter of *d*, would be ⅝ inch. Steel bushings or thimbles *b*, are turned to fit the different-sized holes up to 1⅛ inch in diameter. A small hole is drilled through the bushing *c*, and the end *d*, for the insertion of a steel pin to hold the bushing in place. The reader will readily comprehend how different-sized tools may thus be made to cover a large and general class of work. A small box will be found very convenient for holding the thimbles, and they may always be found.

COUNTER BORE.

I have thought of giving a table of sizes for the ends *d*, to suit the different sizes of counter bores, but these may readily be determined by the manufacturers to best serve their purpose.

A similar tool may be made which is, perhaps, preferable for some manufacturers as it covers more ground, by using a round steel bar instead of the flat cutter *a*. This bar should be about one inch in diameter, having a narrow slot for the reception of the cutter similar to the ordinary boring bar in use. Below the slot the bar should be made the same as the end *d*, for the reception of the bushings.

In writing up these ideas, under the head of "Shop Kinks," I do not wish it to be understood (by those who may feel disposed to criticise) that all of the tools and devices are claimed as being original, but that there are many shops in this country who do not use these convenient and labor-saving tools. Some shops give little or no time to experiment. It is with the hope to benefit those, together with any others who may feel disposed to avail themselves of the suggestions made, that the writer presents these topics. It is also desired to invite friendly criticism and to interest other practical men, causing them to give the readers of the AMERICAN MACHINIST the benefit of their views.

Cast-Metal Screws.

Making screws of cast-metal is a subject which has sometimes been made use of to test the skill of moulders. This process has been closely allied to the difficult operation of moulding a tea cup and saucer with a spoon in the cup, so that, when the casting is done, the three articles shall all be in one piece. To cast a screw with a smooth even thread has been considered by moulders a very fine piece of work, and the process has not been put into practical use until recently, when Mr. W. A. Ingalls, of Providence, R. I., invented a process, by means of which screws might be made smooth, straight, and of a uniform thickness. These screws are moulded in sand, and in such a way that they are free from scars; and the seam, or mark upon castings caused by joining the flask in ordinary moulding, is, by the new process, entirely avoided. The screws made by this process are applicable to all the conditions where screws are generally used for developing power. They are made of cast steel, malleable or common gray iron or brass, depending upon the adaptation for different classes of work. They are made of any required diameter, from ¼ inch upwards; also, of any length or pitch, or shape of thread.

NEW BELL JACK.

One of the principal advantages of the screws made by the new process is, that by casting in sand the surface of the metal is chilled; so that when properly cleaned, it presents a harder and more durable wearing surface than a screw that has been cut in a lathe. Greater strength is also claimed for the above reason. The skin on the surface of the metal renders the screws less liable to twist or bend.

BUNG BUSH.

The bell jack represented by the engraving is made entirely of cast iron, the screw being of a special mixture which will bend before breaking, thus rendering it capable of performing the work of the ordinary jack screw, yet being free from the danger which would be incurred if the screw were made of common cast iron. These jack screws are intended for general work, and possess the advantage of having a platen to be substituted for the swivel cup, so that it may be used as a temporary press screw. This feature is very desirable for use upon the farm, in the mill, or quarry, particularly as they are furnished at a nominal cost.

The bung bushing, also represented by the engraving, is cast by the same process, and is used in beer kegs, and allows the bung to be inserted and removed repeatedly without injuring the cask. These bushes have a concave flange, making them light yet very strong.

The cast-metal screws are becoming extensively used for office chairs and stools; the heads being cast solid upon the screws makes it impossible for them to work loose. These cast-metal screws are made by the Seeger Manufacturing Company, 425 Main street, Springfield, Mass.

Newly Incorporated Massachusetts Companies.

The Union Needle Company, of Middleborough.—Albert Alden, president; Clarence L. Hathaway, treasurer. Capital, $40,000, in shares of $100 each. For the manufacture and sale of sewing machine or other needles, and other articles from steel, wire or other materials.

The Benson Patent Manufacturing Company, Boston.—Geo. M. Buttrick, president; Joseph Warren Alden, treasurer. Capital, $50,000, in shares of $100 each. For the manufacture and sale of conical studs and sockets, under the patent of Joseph Benson, for improvements in window-sash tighteners, and applying the studs and sockets to window sashes and frames, the purchase of the patent and selling rights and granting licenses to use the same.

The Wentworth Manufacturing Company, Boston.—Wm. H. Martin, president; Nicholas J. Wadden treasurer. Capital, $10,000, in shares of $100 each. For the manufacture of carpet lining, stair pads, batting and wadding. October 11th.

New Incorporated New York Companies.

The People's Fire Alarm Company of the city of New York: capital, $250,000; par value of shares, $100. For the manufacture and sale of the Thermostal Fire Alarms and improvements.

The Wallkill Portland Cement Company, Carthage Landing: capital stock, $100,000; par value of shares, $100. For the manufacture and sale of Portland Cement and the constituents thereof. Trustees, Theodore F. Crane, James H. Hoadley, and J. Gardner Sanderson.

The Patent Glass Caster Company, of New York: capital, $50,000; par value of shares, $100. For the manufacture and sale of glass ball furniture and piano casters, under the "Adgate" and "Cowell" patents, and any and all business pertaining thereto. Parts of manufacture may be done at Newark, N. J., and at Pittsburgh, Pa.

The Hackett Automatic Hatch Door Company, of New York: capital stock, $250,000; par value of shares, $25. For the manufacture, erection and sale of machinery for automatically operating Hatch doors.

The Lugo Dynamo Electric Company, of New York: capital stock, $100,000; par value of shares, $100. For the purchase, use and sale of patents relating to the transmission of signals and communications by telegraph and telephone, and to own, manufacture, and license the manufacture and use of apparatus used in the transmission of such signals and communications.

The Gold and Silver Alloy Company, of Brooklyn, N. Y.: capital, $500,000; par value of shares, $100. For the manufacture, introduction and use of mining machinery, and the treatment of ores.

The International Tallow and Soap Manufacturing and Industrial Company, of New York: capital stock, $500; par value of shares, $100. For the manufacture of tallow and grease (under patents) and for the manufacture of soap and oil.

The American Electric Light Company,

"Limited," of New York: capital stock, $100,000; par value of shares, $100. For the manufacture and sale of electric machines, lamps, and appliances.

The Western New York Egg Company, of Montezuma, Cayuga county: capital stock, $1,000,000; par value of shares, $100. For the manufacture of a compound for preserving eggs, without the use of lime or any other deleterious substance, and the sale of eggs in twenty of the western counties of the State of New York.

Eagle Manufacturing Company, of Staatsburgh: capital, $50,000; par value of shares, $100. For the manufacture and sale of yeast and baking powders, and bakers' and grocers' sundries.

Electric Chemical Manufacturing Company, of New York: capital stock, $1,000,000; par value of shares, $10. For the manufacture and sale of electro-chemical, and all other kinds of electrical machinery. Wm. W. Horton, A. J. Severance, and Chas. B. Hall, incorporators.

Church's Water Waste Indicator Company, of New York: capital stock, $300,000; par value of shares, $100. For the manufacture and sale of apparatus for detecting and determining waste, and controlling the consumption of water.

The American Water Works Construction Company, of New York: capital stock, $1,000,000; par value of shares, $25. For manufacturing everything pertaining to water-works, and accumulating, storing, conducting, selling, furnishing and supplying water for manufacturing, municipal and agricultural purposes, and for acquiring, leasing, and conveying lands and water power in the United States and foreign countries.

Champion Billiard Table Company, of New York: capital stock, $10,000; par value of shares, $10. To manufacture, repair, buy sell and deal generally in billiard tables, and the materials necessary for the manufacture thereof: billiard balls, cues, racks and all other articles incident or appurtenant to the game of billiards.

The Anthracite Fuel Company, of Port Ewen, N. Y.: capital stock, $20,000; par value of shares, $1,000. For the manufacture and sale of fuel, and any or all the articles used in its manufacture. Filed Oct. 12, 1880.

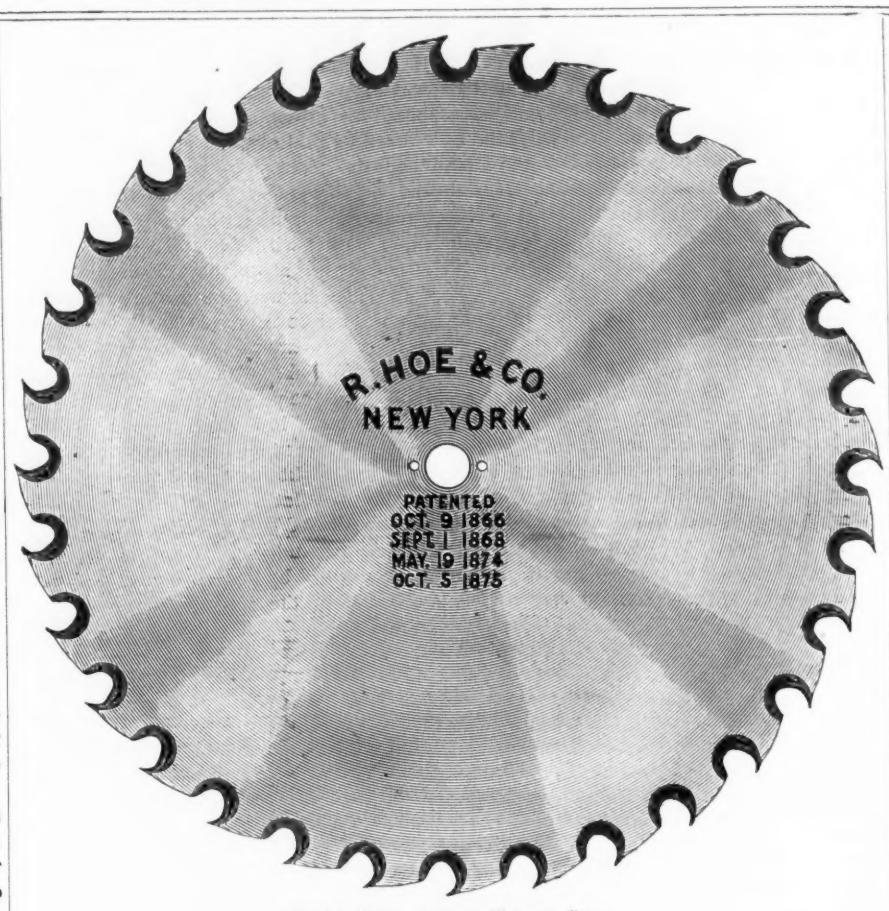
Felhven Powder Company, of Baychester, Westchester County, N. Y.: capital stock, $20,000; par value of shares, $50.00. For the manufacture and sale of gunpowder, being an improved blasting powder, under patent issued to Charles Felhven of New York, July 1, 1879. Filed Oct. 12, 1880.

Dynamo-Electric Power and Light Company, of New York and Boston: capital stock, $5,000,000; par value of shares, $100. For the construction and operation of machines for generating and transmitting electricity to be used for power and light, and to purchase, hold and convey any real and personal estate that may be necessary to carry on operations named above. Filed Oct. 13, 1880.

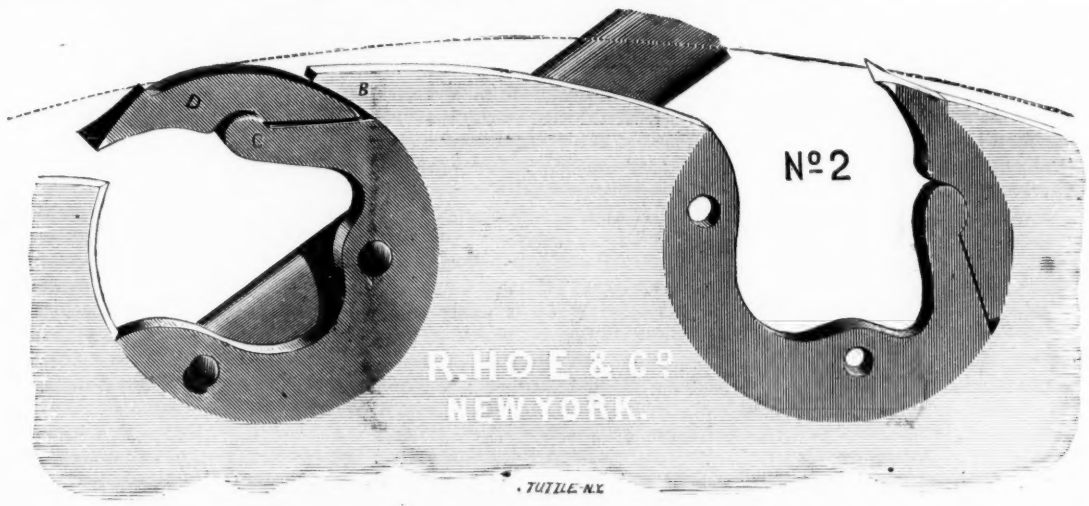
Buffalo, Cleveland and Chicago Railway Company: capital stock, $2,000,000; par value of shares, $100. Directors—H. V. A. Post, Charles Pomeroy, J. G. Trick, John D. Reynolds, Munroe Chubb, Morgan G. Post, Charles E. Kimball, Thomas B. Curry, J. D. Mitchell and John F. Hart, of New York; F. J. Kimball and C. H. Clark, of Philadelphia, Pa., and Archer N. Martin, of Summit, N. J. To construct, maintain and operate a railroad, commencing in the city of Buffalo, running thence in a southwesterly direction to or near State line, Chautauqua county, on the boundary line between New York and Pennsylvania. Length of road, about sixty-five miles.

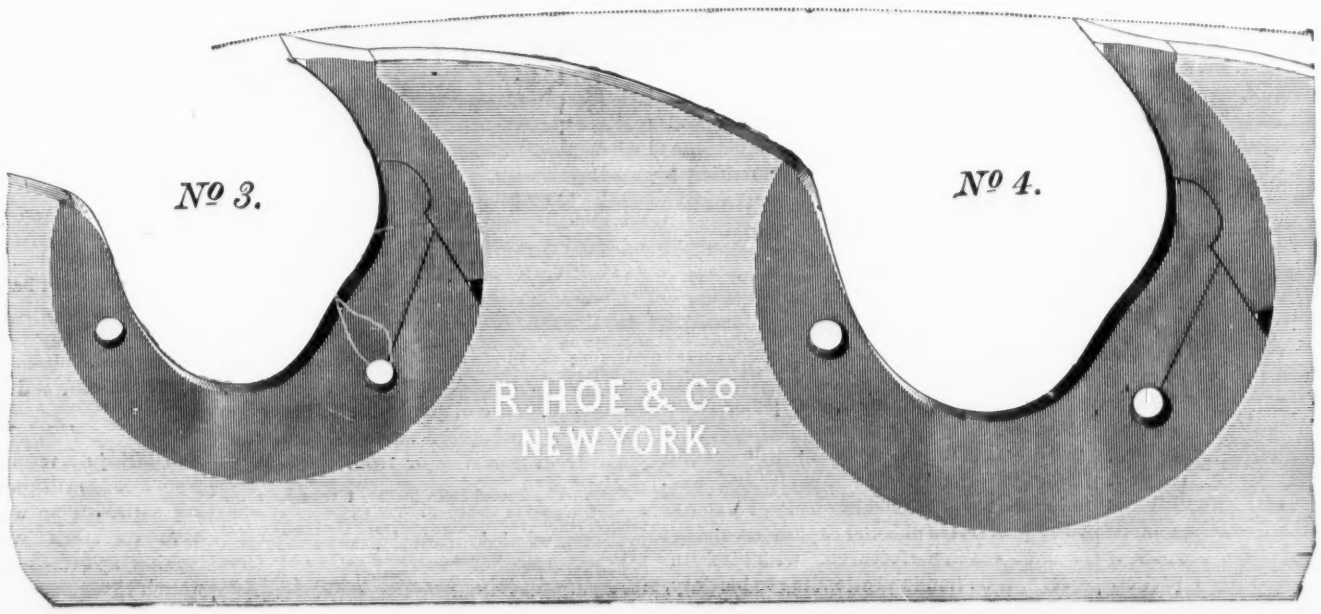
New York, Brooklyn and Rockaway Railroad Company: capital stock, $500,000; par value of shares, $100. Directors—A. D. Vinton, William J. Fryer, Jr., T. Lindsley and E. J. Dunning, Jr., of New York; W. E. Donvin, J. C. Wood, Jessie Johnson, C. L. Snow, E. K. Terry and H. A. Weed, of Brooklyn; Frank Crooke and Charles Crooke, of Flatbush, and H. H. Bostwick, of Stapleton. To construct, maintain and operate a railroad, commencing at a point in the town of Flatbush, on the line of the Brooklyn, Flatbush and Coney Island Railway, at or near Prospect Park, running thence southeasterly through town of Flatbush to Atlantic Ocean at or near a point on Rockaway Inlet.

At a recent trial of portable engines at Albion, N. Y., Reynolds & Lang, Ithaca, N. Y., took the first premium and a special prize of $25.



HOE'S NEW CHISEL-TOOTH SAW.





Improvements in Chisel-Tooth Saws.

Some years ago the Hoe chisel-tooth saw was introduced to the public, and owing to its superior mechanical arrangement and excellence of workmanship won the confidence of mill men, so as to be very extensively adopted, not only in this country, but abroad. The inserted tooth is strong and simple in construction, and expeditious in action. Each insertion of a new set of bits makes the chisel tooth saw in much better condition than it is possible to make a solid saw by dressing it in any of the ordinary ways. Several improvements have been made, at different times, in this chisel tooth.

The latest one is shown in the engravings on this page, which any practical man will appreciate, as it forms a more elastic tooth than that heretofore in use, and is less liable to get loose.

The chisel bits are forged into such perfect shape that they do not break when cutting knots. They also cut iron or stone at a small fraction of the cost and damage occasioned to a solid tooth saw. A solid tooth circular saw must be rounded, and all the teeth swayed out, cut down, and filed to an edge, when a half dozen teeth are dulled by cutting a stone or nail. This involves considerable expense. A half dozen bits for the inserted tooth saw cost but a few cents.

The cutting bits, being short, are exceedingly stiff, and the matching of the circular back with the plate precludes the possibility of any lateral or rocking movement. They will run a long time before sharpening is necessary, and may be pointed up ten to twenty times.

No. 3 and No. 4 show two sizes of sockets, and the teeth employed. A smaller size, shown in No. 2, is used for edgers, and is well adapted for gangs, as the teeth are so readily changed that the saws need never be taken from the mandrel.

Manufacturing Notes.

H. G. Farr, of Brandon, Vt., is organizing a stock company, with $120,000 capital, to manufacture patent self-lubricating graphite bearings for wagons, car wheels and machinery.

The Appleton, Wis., Paper & Pulp Co. have decided to erect a mill of large capacity on the site of the old Appleton stave factory, for the manufacture of book paper.

Newark, O., citizens talk of a $20,000 company to manufacture a boiler patented by A. H. Fowler, of that city.

Steinway & Sons, of New York, will build a shop at Leominster, Mass., the construction of which will require 216,000 feet of lumber.

Hook's Smelting Company, Philadelphia, have been compelled to enlarge the capacity of their works on Broad street. They are four weeks behind in their orders.

The Herreshoff Works at Bristol, R. I., have turned out a torpedo boat for the Russian Government, 60 ft. long, which has made twenty-three miles an hour on her trial trip.

The city of Kingston, N. Y., voted by a large majority, Oct. 13, not to have water works. The citizens probably prefer to take their beverages straight.

Explosion of a Flue Boiler.

[From *The Locomotive*, published by the Hartford Boiler Insurance Co.]

A very destructive explosion of a rolling mill boiler occurred on the 11th of May, 1880, caused by a collapse of a large flue. It was a cylindrical, horizontal, single-flue boiler, built about 1870, and was 20 feet long, 4 feet diameter, made throughout of iron not less than ⅝ths of an inch thick. The flue was 22 inches diameter, and extended from end to end. The boiler was placed over a re-heating furnace and heated by the waste gases which entered the chamber below the boiler at the rear end, as indicated by the arrows, Fig. 2, passed the length of the boiler in contact with its lower half, and returned by way of the flue to the chimney. The boiler was supported at a height of ten or twelve feet above the ground by three pairs of cast-iron brackets, which were riveted to the shell and rested upon the side walls. The boiler had flat wrought-iron heads flanged to the shell and flue, and stayed by twelve braces about four feet long, part of which were fastened to T irons placed horizontally above the flue, one on each head, and the inner ends of the brace, were attached to the ring of steel plates that joined each head, as shown by the dotted lines *s,s*, etc., Fig. 2. This boiler was one of a system of ten which were similarly set and heated, all connected to two or more main steam pipes, and each provided with a steam stop valve, a safety valve, and three gauge cocks, but each did not have a steam gauge. This particular boiler being without a steam gauge, there was no means of ascertaining the pressure when the stop valve *D*, was closed, except by such indications as the two-inch patent lock-up safety valve afforded. This boiler was supplied with water (the temperature of which is not known, but probably variable) at intervals through the pipe *A*, Fig. 2, as often as it got low, and no doubt as rapidly as could be done with the pump or large injector. The blow-off pipe *B*, was located at the bottom and afforded means of completely emptying the boiler.

On Monday morning, at about five o'clock, the steam stop valve *D*, had been closed for an hour or so to repair a steam pipe, and the two inch lock-up safety valve *C*, (which had neither cover nor lock), had been blocked open by means of a bit of wood, placed inside the case to relieve the boiler while the repairs were going on. The repairs done, the attendant let down the safety valve, and was about to open, or had partly opened, the steam stop valve, when the explosion occurred. The cuts have been prepared from photographs and sketches, and the case has been made up, as well as may be, from them and the published evidence given to the coroner's jury. The boiler shell, Fig. 1, containing 3½ lengths of the flue, flew through the roof of the mill, taking a direction so that it landed nearly in a line with its projected axis, at a distance of 130 yards from its working site, striking and demolishing a large area of the mill roof and a brick chimney in its flight. It struck the ground several yards short of where it stopped, and ploughed a deep furrow in the ground in which it lay partly imbedded, the same end foremost that it had in the mill, by which operation the foremost head *K*, was partly broken from the shell and the shell distorted, something as shown in sketch, Fig. 1. Of the parts of the flue that went with the boiler shell, that shown in Fig. 3 was dropped out in its flight at about one-third the distance made by the shell, while the other two Figs., 4 and 5, remained in the shell, but entirely broken apart and from the head. The sides of the piece, Fig. 3, of the flue were shut together with such force as to emboss the forms of the heads inside upon the exterior surface opposite *W*, Fig. 3, and the two inner surfaces were in perfect contact as though the iron had been soft as wax when the parts came together; but there was also visible at *S*, the very summit of the flue when in its place, a dark, shiny, thin scale, which is often seen inside of boilers using a particular kind of water, which had not lost its glossy appearance, nor changed in color, indicating that it had not been hotter than usual since the scale was deposited there. Samples of iron having on them this kind of deposit have since been exposed to the heat, and it is found that a heat sufficient to change a brightened spot on the iron to a blue color, say about 550° or 600° *F.*, was sufficient to blister the deposit and destroy its luster.

The experts who testified before the coroner differ as to the cause of the collapse, and it is probable from the nature of the subject that they will always differ in such cases. Experts from the scientific schools and from the learned professions are seldom in perfect accord when giving testimony, and often their opinions differ so widely that it is necessary to appeal to common sense.

We hear much lately about color blindness, and reforms in modern practices call for a test of certain persons in very responsible positions as to their faculty of correctly distinguishing colors. And where this faculty is an essential qualification in reading the symptoms of a disease, or in the estimation of the properties that characterize a substance under examination, this personal defect would seem to be a sufficient reason for such wide differences of opinion. There may be mental defects corresponding in some degree to this personal one which vitiate the logic of events and account for some wonderful decisions.

It is the object of the present writing to offer an unbiased technical discussion of this case in the light of this company's experience, and for the good of all whom it may concern.

This boiler was a fair sample of a one-flue boiler, both as to material and workmanship, capable of bearing safely, when sound, the working pressure of 70 pounds, which was about one-third of the collapsing pressure of the flue if it was round and sound. It was run as boilers usually are in works of this kind. A man of good habits was in attendance, who believed in plenty of water as a sure preventive of boiler explosions, and his practice was in perfect accord with his faith.

He was on hand and attending to his duty, which was first, last, and exclusively to see that ten boilers were fully supplied with water. He did not help repair the broken pipe; his attention was therefore not distracted by that event. The feed-valve was open, the steam pump was in motion while the men were at work on the pipe. So swears the engineer who repaired the broken pipe. Other witnesses swear that the boiler attendant was about there trying the gauge-cocks; that he was seen trying gauges a few minutes before the explosion. The master mechanic swears that he, the boiler attendant, is directed to fill up as soon as the water falls below the upper cock; that he saw no indications of low water in the exploded boiler. Thus much, and no doubt more, evidence might be quoted relating to the probability that water was or was not low in the exploded boiler; all of which would be of no account if the theory of low water was confirmed by the testimony of the flue itself and by the general character of the

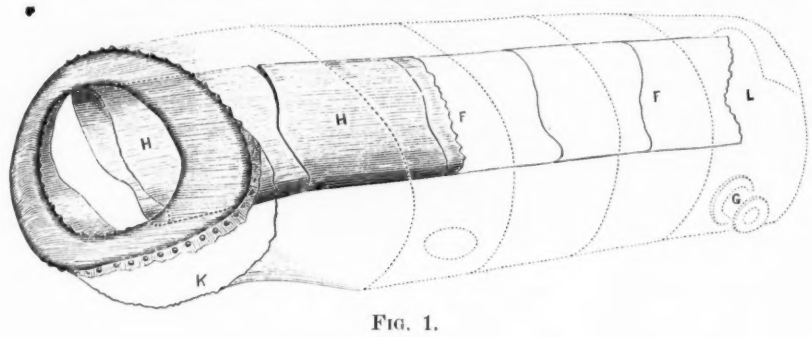


Fig. 1.

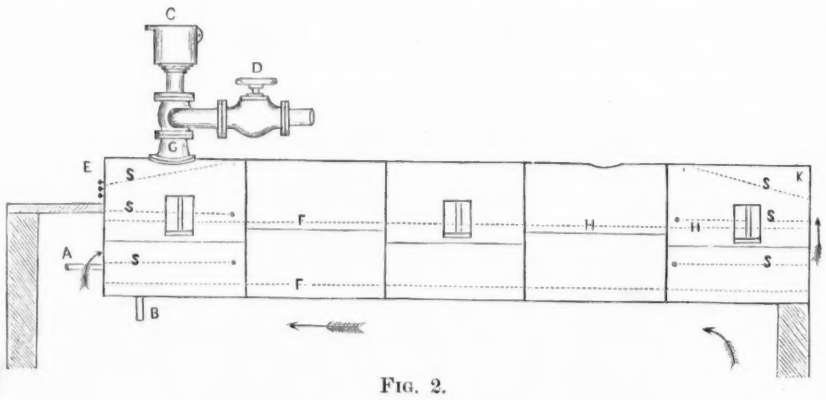


Fig. 2.

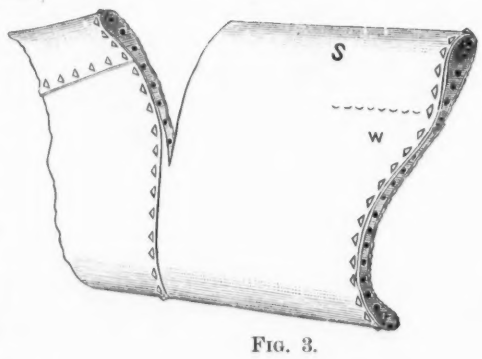


Fig. 3.

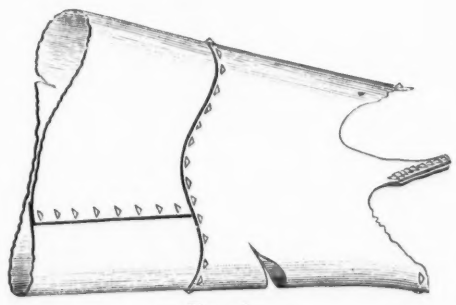


Fig. 4.

explosion. Is it so confirmed? The records show that boilers which explode with no water in them are not shot through the air like a rocket, and those containing small quantities go short distances. The records also show that large horizontal flues that

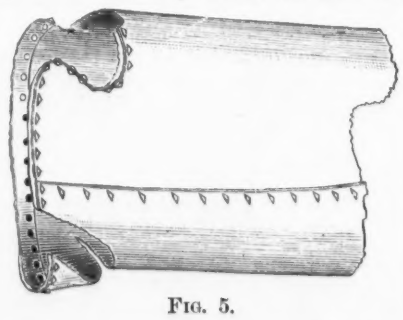


Fig. 5.

collapse on account of being softened by heat invariably cave in from the top only, and that lateral collapse is due to distortion of form or weakness at the side-longitudinal seams from grooving or from thinning of the plate by corrosion. Two witnesses swear that grooving was observed, but as its location was not indicated, little can be said about it. The parts not shown in the illustrations were cut to pieces and worked up, and no sketches or description of them were obtained. It must have been on those parts if there was grooving, as none was found on the parts sketched.

Finally, to satisfactorily account for all the phenomena that attended this explosion, we only have to show that the safety-valve was jammed so that it did not prevent the rise of the pressure, and that the stop-valve was closed, or just being rapidly opened, at the instant when the limit of endurance had been reached by the boiler; and, as every circumstance and all the testimony confirm the latter requisite, we have only to imagine that this small valve, with its compound levers and disc weights huddled into a case of 8 or 10 inches diameter and of less depth, which had been blocked open by means of a bit of wood placed against one of the levers when full relief to the boiler by its means was desired, was accidentally jammed when it was let down. The propositions below will not appear absurd to those who realize that over 3,000 cases of defective condition of safety-valves, most of them originally correct and proper, had been detected by this company's inspectors during the first twelve years of its experience, out of which number 1,400 were reported as dangerous, and that thousands of defects have been reported that were dangerous only in the event of an accidental over-pressure.

The following proposition seems to account for all the phenomena attending this explosion, while the theory of low water does not:

THE HYPOTHESIS

is, an accidental sealing of the boiler after the broken steam pipe was repaired, the stop-valve *D*, being still closed (or in the process of being rapidly opened), and the safety-valve jammed, the generating surfaces of the boiler in full action, the pressure rapidly rising, the flue, at best only about half as strong as the shell, had acquired (from the sudden thermal changes, due perhaps to the influence of the cold feed-water among other abuses of its ten years' night and day work) an obscure weakness, flattening, thinning, or grooving at a longitudinal seam, and the limit of its resisting power was soon reached at no *very* high pressure, and it collapsed near the middle of its length. The head *L*, being the weaker, for obvious reasons, of the two, gave way instantly when the shock of the collapse was added to its now extraordinary steam load, and it, with nearly half of the flue, fell inside the mill, and the expanding water began to issue from the open end of the boiler (the free steam from the steam space having left in one puff), while the boiler shell, with the remaining parts of the flue, started in the opposite direction, precisely as a rocket would do similarly placed after the compound was ignited, and in a similar manner it continued its flight until the expansive force was exhausted. Hence it will be seen that with so large an opening there must have been considerable contained water to send it so far.

Note.—The dotted lines in Fig. 1 represent the unbroken part of the shell. The shaded portion at the left shows the foremost parts of the shell broken by the fall. The shaded portion of the flue remained in the shell, and that portion in flue outlines was blown out with the missing portion of the head at the right.

Vibrations from Machinery. — The French Society for the Encouragement of National Industry, which offered a prize of $400 for the invention of a means for deadening the shocks and vibrations to buildings caused by steam hammers and other heavy machinery, awarded one-fourth the amount for a device which consisted of introducing India rubber plates between the foundation of the machine and the floor.

A girl just returned to Hannibal, Mo., from a Boston High School, said, upon seeing a fire-engine work: "Who would eva have dweamed such a very diminutive looking apawatus would hold so much wattah!"

A Monster Casting.

A few days ago a casting was successfully made at the Black Diamond Steel Works, Pittsburgh, Pa., which weighed 160 tons. It is believed to be, by all odds, the largest casting ever turned out in the United States. It is intended for the anvil block of a seventeen-ton steam hammer which will strike a twenty-ton blow. The Pittsburgh *Dispatch* gives the following description of the operation of casting :

The details of the preparation of the mould and the pouring will be read with interest. The mould was built of fire brick, with fire clay mortar, plastered with a lining of loam and faced with black lead, and the whole thoroughly dried. The dimensions are 11 feet high, 8 by 10 feet at the base, and tapering to 4 by 6 feet at the top. On the outside were placed iron clamps, binding the mould so firmly as to resist the immense pressure which the molten metal would make. This elaborate beginning, for it was merely a beginning, the end of which none could predict with certainty, was ready yesterday morning for the five cupolas which were to be used to melt the 160 tons of iron required. Accordingly the charging was commenced at five o'clock and the blast started. In fifteen minutes the stoppers were removed and metal run into the general receiver. At 7:20 the first run was made into the mould in excellent condition, and throwing off sparks equal in beauty to the most elaborate pyrotechnic display. In 5 hours and 11 minutes from the time of tapping it, at 11:56 A. M., the casting was an accomplished fact, and satisfaction beamed on the faces of proprietors, workmen, and visitors, pulses went down to their normal condition, and a deep and simultaneous transpiration of relief was evolved equal in volume to the whirl of a Sturtevant blower. The work was done rapidly, indeed notably fast, and without a mishap to mar the satisfaction. No less than five of Sturtevant's No. 8 fans were used. A careful test was made, and it was found that the pressure of blast secured for four of the cupolas was twelve ounces to the square inch, and eleven and one-half ounces to the five cupolas. The anvil block, after being allowed to remain in the mould for six weeks, will be turned over upon the 17-ton steam hammer foundation, which will be accomplished with the use of four of the celebrated Richard Dudgeon 60-ton hydraulic jacks. The large steam hammer, for which this anvil block is to be used, is being built by Wm. B. Bement & Son, Philadelphia, at a total cost of $52,000. The framework, or stands, will be constructed of wrought iron plates seven-eighths of an inch in thickness, riveted together with 1¼ inch rivets. The "tup" or "drop," together with the piston-rod and piston and "die," will weigh 17 tons, and be the heaviest steam hammer in this country, giving, with steam on top of the piston, a stroke of 20 tons.

The foundation for the anvil involved a large outlay. The excavation was 27 feet deep and 30 by 50 feet. In the bottom of this pit cement piles were placed, and, before hardening, this cement was rammed hard and surmounted with a 12-inch layer of concrete. On this was placed a layer of Monongahela oak logs, 14x14 inches square and 22 feet long. At right angles to this came another layer of similar logs, all being firmly bolted together. Topping this mass of timber was placed a ponderous plate of cast iron, 10 by 16 feet and 8 inches thick. On this was placed a solid mass of perpendicular timbers, 11 feet high, of logs 14 inches square; and on top of this mass of wood will be placed the enormous block of metal cast yesterday, all this ponderosity being necessary to resist the mighty "punching" which white hot ingots will receive under 17 tons of hammer, propelled "from the shoulder" by high pressure steam. Major Hancock, Superintendent of the Black Diamond Mill, states that, with their present facilities, steel ingots weighing seventeen tons can be cast, and the hammer can attend to shaping them out. They have on hand now a number of ingots 5½ feet by 30 inches square, weighing seven tons each, on which the "big hitter" will try its powers of impact.

Narrow-Gauge Railways in France.

Railways of one meter-gauge for working local traffic in France, says *Engineering*, have been built to an extent sufficient to test the advantages of cheap construction and working, and the disadvantages of a break of gauge. Not to speak of a few isolated narrow-gauge lines which were made several years ago and have been working successfully, the first railway of what may be regarded as the system of narrow-gauge connecting and local service lines, was that between Lagny and Villeneuve-le-Comte, a distance of 7½ miles, not including an extension for goods traffic from Villeneuve to Bois-Breton, where recently a more important railway was completed from Persan-Beaumont, a station on the line between Pontoise and Creil, and Thermes, a station on the line from Creil to Beauvais; the length of this line is 20 miles. A section from Gray to Bucey-les-Gy, about 16 miles long, has also been completed. *La Nature* states that the most important narrow-gauge line yet undertaken in France will be that running across the department of the Pas de Calais from Calais to Anoires, and which will have a length of nearly 60 miles. It is laid out to serve the towns and villages of the department which require railway accommodation, and have neither population nor business sufficient to give employment to an ordinary railway. There will be eleven stations, not including those connecting stations with the Northern railway of France. The line will be opened in three sections: 1. From Anoires to Lumbres, in 1881. 2. From Saint-Pierre to Guines, also next year, and 3, from Guines to Lumbres in 1882. There will be also a short branch from St. Pierre to Calais. The gradients on this line will not exceed 1 in 66, and the minimum radius for the curves will be 426 feet and 328 feet in the stations. The authorized speed between stations will be about 30 miles an hour, and the mean, including stations, 15 miles. The estimated cost of the line, including purchase of land, rolling-stock, and fixed plant is only £2,720, a mile, or one-fifth that of the cheapest French railways of standard gauge and double track, or half the cost of single ordinary gauge lines.

An Improved Hand Lathe.

The cut herewith represents a newly designed hand lathe. The head spindle is of steel, with ½ inch hole through it; has extra heavy conical bearings; fitted to solid boxes, and is accurately bored out to receive the centers. The cone pulley is balanced, and has four changes of speed, for 1½ inch belt. The tail spindle is of steel, accurately bored out for the center. A lever attachment is fitted to it in addition to the screw, if desired. Two T rests accompany each lathe. The slide rest is of improved design, and is fitted to the Vs when desired. The counter shaft has tight and loose pulley, 6x2 inches; and the cone pulley is turned true on the inside to balance it.

The machine is of neat design and is thoroughly made of the best material. It swings 10½ inches over the bed.

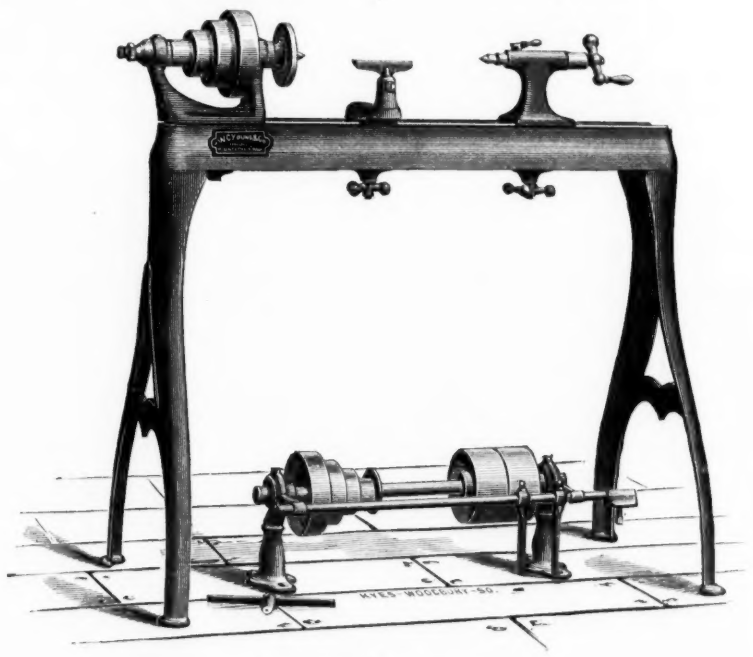
This lathe is a new production of W. C. Young & Co., Worcester, Mass. The bushings or boxes are made of best grey iron, which is claimed to give best results.

A correspondent of *Carpentry and Building* says:

Experience and observation have taught me that a moderately thick oil stone, set in the box on edge, will give the best satisfaction, as it will wear truer and not get hollow in the center from edge to edge like those that are laid flat. I advise always to wipe the stone after using it. This plan will consume more oil, but it will pay, nevertheless. Never leave an oil stone dirty over night. The oil sets into the pores and forms a gum which destroys the coating qualities. The Washita or Arkansas stones are the best. Turkish oil stones, I am informed, are not at present imported, on account of their inferiority in comparison with those of our own country.

I believe the best way to file saws is to file toward the handle. Henry Disston said that saws for different kinds of work require the teeth filed to different shapes; that generally there is not enough space for the dust between the teeth; that a saw, to cut fast, must have deep teeth. Experience has proved to me that a saw can be too coarse—that a fine saw cuts faster and cleaner, proportionately, than a coarse saw. I would never buy a cross-cut or rip saw with more than seven points or teeth to the inch, and a cross-cut is better with eight than seven. With regard to saw sets, I believe Henry Disston is the only man who has ever employed the correct principles in their construction, viz.: The use of a different punch or slot, as the case may be, for the different sizes of teeth. In other words, the gauge of the set should be made to conform to the gauge of the teeth. There is no mechanic who will not admit that a set suitable for a 14-point saw is not equally well adapted to a 5-point saw, and *vice versa*. I believe that nine-tenths of the saw sets made are worthless for the purpose.

Operations have begun in the new cutlery works at Wilmington, Ill.



Improved Hand Lathe.

Letters from Practical Men.

TAPPING HOLES.

Editor American Machinist:

Noticing, in the last issue, the device for tapping holes, I am reminded of the convenience of making the "entering" tap of a set, with a plug end, the size of the bottom of the thread, and at least as long as its diameter. It serves as a gauge for the proper size of hole and will follow the hole exactly.

Respectfully,
J. E. Wilson.

Bridgeport, Ct., Oct. 8, 1880.

MORE "POLISH."

Editor American Machinist:

It has been quite interesting to watch the result of Chordal's call for some practical hints on polishing. Chordal is mistaken when he says that what he could say about polishing "would not be worth the paper it was printed on," because he knows the theoretical principles underlying the art of polishing, and would scarcely dare to advance the strange idea that anything in mechanics can be done easier and better by being ignorant of the theoretical requirements.

The first requirement is clean metal, so close grained that the pores of it are not visible to the naked eye. The next thing brings us to something which all the writers have failed to give, viz.: the definition of polish. A polished surface is one on which all the high and irregular points have been reduced, till nothing is visible to the naked eye but the luster of the metal.

One writer speaks of getting the "scratches straight around the work," but it is not a true polish until all scratches are invisible in any part of the surface.

A surface plate that has been carefully used for a long time will attain such a high polish that it reflects almost like a mirror. This is caused simply by rubbing down the high places.

Now for the practical part of polishing. There are three classes of polishing in lathe work: first, faced work, such as cylinder heads; second, journals; third, irregular work, such as handles, and various other pieces that need to be polished for beauty.

A very successful method for faced work has been in practice here, and is as follows: The last cut is taken with a broad cutting spring tool, which does its work very much like a scraper. For curved places like the ogee of a cylinder head, a spring tool is made with the cutting edge shaped to the requisite curves, which (after roughing nearly to shape with another tool) is brought up to the work and kept there till it scrapes all the tool marks out, and almost cuts itself free from the piece. It can then be finished with emery paper or cloth, and given the final touch with crocus or something equally fine. The straight-faced part is reduced by using a piece of lead on the end of a stick, or rather handle, made purposely, the lead having an even flat surface on one side, which is brought flat against the work and given an oscillating motion, by having the handle pivoted on a point between the lead and the hand of the operator. By keeping on plenty of oil and emery, and exerting a fair pressure, it does not require much time until it is smooth enough to apply the emery cloth and the crocus. Care must be taken not to run at too high a speed with this device, or the surface will heat and glaze.

The spring tool is better than scrapers because it produces a more even surface. It is impossible to scrape the surface even in the lathe by hand, and, as a consequence, when a scraped surface is given a *real polish* there are certain positions of the light which will cause this unevenness to show and make it look like a bad job. A spring tool properly made and used will take a smooth cut where scrapes would chatter, but both require good lathes. A frequent mistake is made in scraping, by having the rest too far from the work. It pays to have rests bent around to suit the curves of the work, and thus bring it up as close to the work as possible.

In preparing journals for polishing, it is best to get as smooth and true a cut as possible. It is not best to use a file on journals, for if there are any soft or hard places in the metal it will only make matters worse. After getting a good smooth cut, use lead laps or lead clamps, giving them a lateral motion and supplying oil and emery. After getting out the tool-marks and grinding it round, woodclamps holding emery cloth or corundum, may be used, and the final polish with crocus cloth, or something equally fine.

It is no argument against clamps because "dirt and chips are swept over them and they are filled with grit." Might just as well say, that because a water bucket got thrown under the bench and filled with dirt, therefore, water buckets are a "dead failure." Clamps are a good thing if they are taken care of the same as any good tool should be. The third class of work is so varied that only general limits can be given. For forming all kinds of curved work in the lathe nothing is much better than spring tools. They can be used where it is impossible to use scrapers, on such work as necking out connecting rods, and all work where a round finishes up to a square part by a curve. The use of a speed lathe is important for this class of work, because there is no cumbersome carriage to be always in the way; it saves the other lathes from grit getting in their wearing parts, it reduces the cost, and is generally more satisfactory.

We have heard a great deal about lathe polishing. It would now be in order to hear something about polishing steam chest lids, and such work as cannot be done in a lathe.

A. Randolph.

Salem, Ohio, Oct. 11, 1880.

DISADVANTAGES OF HIGH SPEED ENGINES.

Editor American Machinist:

I sincerely rejoice in open discussion of a point so important as engine speed, and though Mr. Porter can doubtless present an able argument in favor of his high speed motor, yet I want to be convinced. Do not let him, however, assume the position that a perfect work in nature or art can be so considered except with relation to the uses it successfully accomplishes, and with the overtaxing of material in nature causes failure as certainly as in mechanics. Must we not therefore draw the line somewhere? There is an old adage that is constantly in my mind; "The strength of the chain is that of its weakest link." Now, to my mind, an engine is a sort of chain made up of various links, each separate part having its use and its degree of importance. When the engine is erected, and the steam, its living soul, is put into it the chain is complete, and until then we cannot tell how perfect the work will be. But after all so much is known that there is now-a-days no necessity for a badly-proportioned engine, so far as ports, size of rods, shaft, etc. The established and published rules are plain enough, and are the result of years of experience and observation. So far so good. But will the "pin" always run cool, also the main shaft bearings? This is the troublesome spot with most new engines, and increases just in proportion with the increased speed.

Perhaps I am slow in coming to the point, but does not an engine, say 18 by 24, running 200 to 250 revolutions, involve so many links of perfect construction that with ordinary tools and work the times of failure overbalance the times of success. Does not the nice adjustment and fine finish increase the cost? And if it does, would not that extra cost put into a longer stroke engine be a better investment? Men and machines are but human and fail often, and we cannot rival the perfect work of our Creator.

So far I have asked questions. I will, with your permission, state some of my deductions. First, I believe in 500 feet or 600 feet of piston speed, put it in what shape is most convenient. I believe it is about the limit. I believe that an engine wears out from the reciprocating strain of its piston and connections, rather than the rotation of its wheel and shaft; and that the life of an engine is nearly proportional to its stroke inversely. That is, if 100,000,000 turns of the shaft would be the life of an engine of 48″ stroke, the same would be the life of an engine of 24″ stroke very nearly, but the piston would have only traveled half as far. The shaft, piston and rods would have had the shock of change in their direction as many times. The cylinder would have worn out similarly. I believe my position is strong in stating this, and now I say this: The only advantage in a high speed engine is in decreased first cost, and in running the main shaft at such a rate that certain speeds may frequently be obtained with less intermediate gearing. The amount of steam to do a given amount of work should not differ. My own opinion is, that the expenses of careful attendance and repairs soon eat up the saving in first cost. Am I right or wrong?

Yours, &c.,

Erie, Pa. H. R. BARNHURST.

FAST SREW CUTTING.

Editor American Machinist:

If any of your readers can beat the time made in cutting screws here mentioned let him give his experience. The screw was 9 feet long, $3\frac{3}{16}$ inches diameter, pitch of thread 1 inch, bottom of thread $2\frac{1}{4}$ inches diameter. It was cut in one hour and forty-six minutes, on an ordinary slide rest lathe built by Niles Tool Works. I can make an average of four a day.

Yours truly,

ANDY D. HOWARD.

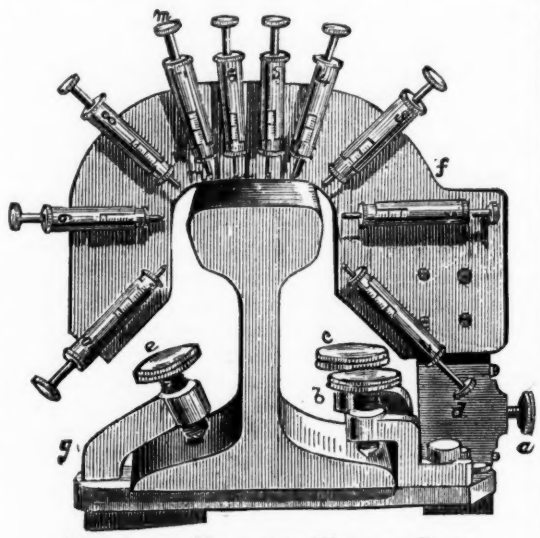
Charlotte, N. C.

A project for furnishing Jefferson, N. Y., with water works is being agitated.

Electric Lighting in London.

The Royal Albert Dock in London, whose basin is 490 feet wide and one mile and a quarter in length, was recently lighted at night, throughout its entire space, by means of electric lamps, twenty-seven in number, placed on latticed iron poles nearly eighty feet high. The lamps are of a new and ingenious construction, calculated to resist the influence of the severest weather. The illuminating power is produced at four stations, judiciously distributed, according as required, over the dock grounds. At each of these stations engines of twenty (nominal) horse power are at work in connection with Siemens' dynamo machines. The lamps are provided with carbons of sufficient power to burn during sixteen hours, while the lights in the sheds are of smaller compass.

The steamer Garonne, one of the huge Australian packets belonging to the Orient line, was docked by means of the electric light. The feat was accomplished with the greatest ease. Not only was the steamer berthed, but the passengers were enabled to land, their baggage being examined, notwithstanding the advanced hour of the night, by the aid of a number of lights placed under the sheds. The illumination in and out of doors was nearly equal to daylight, permitting the transaction of business without hindrance.



DEVISE FOR MEASURING WEAR OF RAILS.

Machine for Bending and Flanging Sheet Metals.

The engraving shown herewith represents a machine especially designed and constructed for the purpose of bending, flanging, and otherwise forming sheet metals.

It flanges and bends such sheets as are required in rectangular tubing for ventilating apparatus, or other like purposes. The shapes can be made almost instantaneously from short lengths to seven feet in length at one operation. The machine will bend sheet iron up to No. 16.

Specimens of the work that can be done withit are illustrated in the engraving, by the shapes of sheet metal represented at *L,L,L*. By certain modifications it is claimed that the machine would be rendered even more efficient for varied and heavier work.

A,A,A, are standard supports for the machine; to the top of the two end ones are bolted strong brackets having an internal thread for square threaded screws *F,F*. The ends of these screws are rigidly attached to the extremities of the bed, *D*. The clamping bar *E,E*, is partly faced with steel as shown in section, Fig 3. A plan of this bar is also shown by Fig 2, where it will be observed that one end has a fixed center, while the other has an opening that allows it to embrace or compass the vertical shaft of the screw *F*, on the right. *G,G*, are handles for raising and lowering the clamping bar *E,E*.

The movement of this clamping bar is slight; all the opening required being a little more than the thickness of the sheet metal. Any sag of this bar, which is a heavy one, is prevented by the tie rod *H*, but which in no way interferes with the lateral or horizontal swinging motion of the bar from its fixed center at *F*, on the left. *C,C*, is the forming bar hanging on two hinges or bearings *K,K*, and operated by the handles *J, J*. To counteract the spring of this bar a

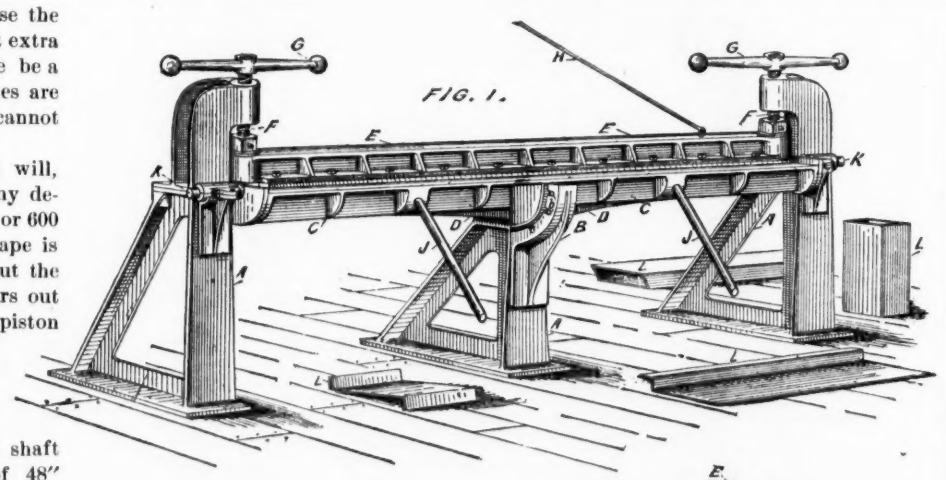


FIG. 1.

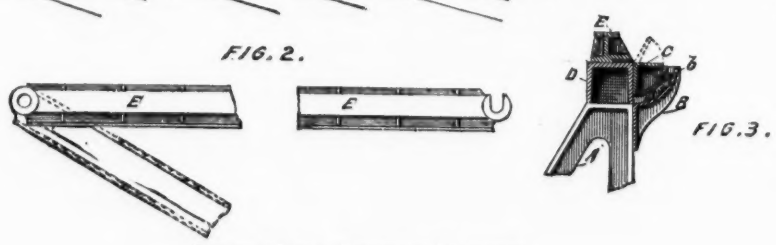


FIG. 2.

FIG. 3.

SHEET METAL BENDING MACHINE.

bracket *B*, holding friction rollers, *b*, is firmly bolted to the middle standard. This bracket *B*, with its friction rollers *b*, are shown clearly in section view Fig. 3.

The manner of operation is as follows: When the metallic sheet is introduced between the bed and the clamping bar, the forming bar *C,C*, is in the position shown in the elevation and at Fig. 3. The clamping bar *E,E*, is screwed down and the sheet is held firmly and immovable as in a vise; the forming bar is then turned up by using the hand levers *J,J*, and the flange or bend made sharp and evenly at once. One of the particular features of this machine is, that long rectangular tubing can be easily formed upon it, after which the clamping bar, on a slight release, can be moved out and the work slided off. If the bar did not swing out the work could not be slid off the machine after it is formed. In ordinary flanging of course this is not necessary.

The machine is one of unusual strength and durability, and, it is claimed, has been constructed so that no spring can take place in any part of it. One of these machines is in operation in this city, and proves entirely successful. The inventor is T. P. Pemberton, 5 Dey St., (Room 13) New York.

Measuring the Wear of Rails.

We take the following description, with the engraving, from *Iron:*

The accompanying engraving represents a handy little apparatus for measuring the wear and tear of rails, which is the invention of Mr. Wm. Craft, of Vienna. This apparatus has been chosen by the Technical Commission of the Society of German Railway Directions as the best out of a number sent in for approval. It consists of two main parts, one of which is the footplate, which is wedge-shaped, with two grips 10 centimeters long on the broad end. In the narrow end is a slot, into which a clamp *g*, is slipped when the plate is under the rail. The screws *b*, *c* and *e* complete the attachment. A rectangular pedestal *d*, is fixed to the footplate with a set screw *a*, for receiving and fastening the shank attached to one side of the plate *f*. The measuring apparatus consists of a metal plate *f*, to which the outside socket-tubes *l*, of the ten measuring pins, are fastened according to the normal section of the rail. The pins are always kept pressed outwards by spiral springs in the sockets *l*, and as the points cannot project beyond the inner edge of the plate *f*, they are protected from injury. In measuring the altered profile of a rail the apparatus is applied as shown in the engraving, the inner socket, *w*, being pressed home to the zero of the vernier on the outer tube *l*. The pins *m*, are then pressed downwards until they touch the surface of the rail. In descending, they carry the inner socket tube *w*, with them. On removing the pressure the pins fly back, but the inner socket tubes remain in their altered position, and the wear and tear of the rail can be measured by the vernier and scale on the inner tube to one-tenth of a millimeter. As soon as all the points have been pushed down, the plate *f*, can be removed, and the altered form of the rail read off in any convenient position.

Setting Engines in Line.

BY JOSHUA ROSE, M. E.

No. 2.

If a steam engine is not a proper line a loss of power and a "*knock*" or "*pound*" is the inevitable result. Indeed all the so-called mysterious "*pounds*" which so often annoy the engineer and offend the ear, may be traced to a want of truth in the crank pin, or a want of being in line of the main parts of the engine, usually the cylinder and main shaft.

An efficient method of locating a "*pound*" is to place one end of a piece of $\frac{1}{4}$ inch wire (about eight inches long) between the teeth, applying the other end to each end of the crank-shaft bearings, cylinder, etc., the violence of the shock in the vicinity of the pound being sufficiently the greatest to indicate its whereabouts.

Pounding, by reason of lost motion in the wearing parts, such as the connecting rod and crank-shaft bearings, is, of course, remediable by taking up the lost motion of those bearings (by the means with which they are usually provided), but if the parts are not true this cannot in many cases be done without causing the bearings to become heated, and lost motion with its accompanying evil of pounding becomes the least of the two evils.

The method to be employed to line an engine, or to discover if it is out of line, depends upon the design of the engine and its condition; thus an engine having a Corliss frame has the slides to receive the cross-head made at a true right angle to the end face which meets the cylinder end; equi-distant from the center of the gland hole or axis of the piston rod, and the end of the frame fitting either the bore of the piston or the turned flange of the cylinder cover; hence the guide bars *must* be true if the frame is got up true, the fit of the frame end to the cylinder end insuring truth in the guide or cross-head slides, providing that the center line of the frame, during the turning and planing operations, lead from the center of the cylinder end of the frame to the center of the crank-shaft brass; or, in other words, the planing and boring of the frame must be true with a line running from the center of the cylinder end of frame to the center of location for the crank shaft. This will not only cause the outside of the frame casting to stand at its proper level when the cylinder

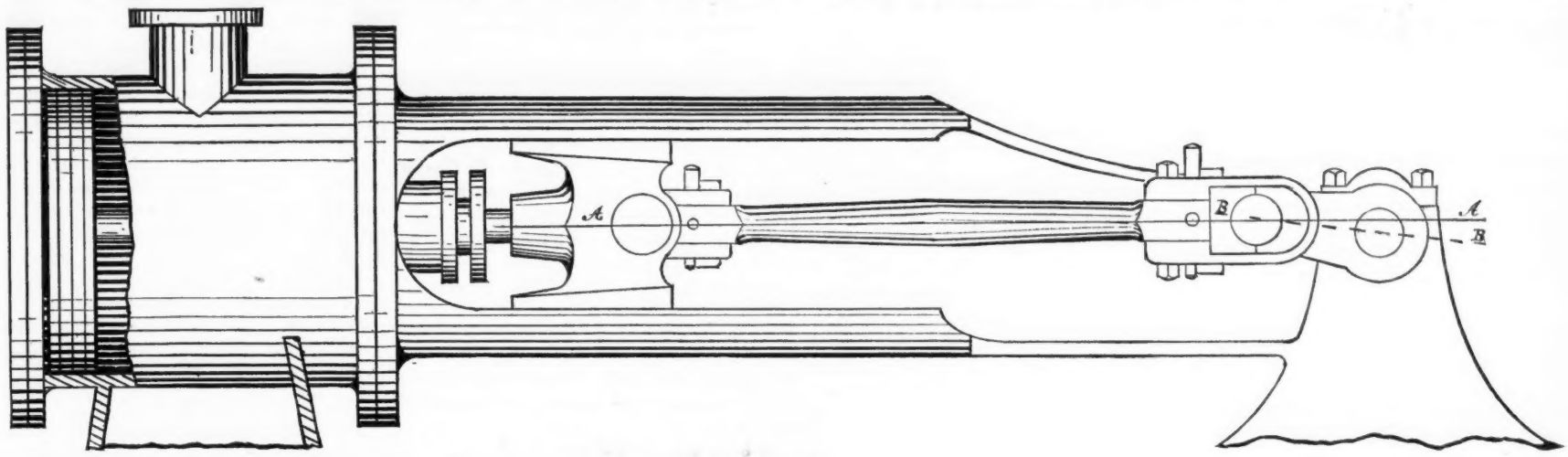


Fig. 1.

bore stands horizontally level; but it will insure that the crank-shaft bearing brasses both be of equal, and of a proper thickness through the crown.

The engine being properly lined at first will not be liable to get out of line, excepting so far as affected by the wear of the crank-shaft bearing, which will cause the crank shaft to drop, as shown in Fig. 1, where *A A* represents the true center line of the cylinder and guide bars which, when the crank is in the position shown in the cut, should be coincident with the center line of the connecting rod and the crank, but the crank brass, having worn below the center line of the connecting rod and crank. They stand out of line as denoted by the line *B B*.

As a result, a portion of the piston movement and pressure which should be exerted on the crank *after* leaving the dead center, will be exerted on it before it reaches the dead center, thus causing a back pressure, involving a loss of power. Furthermore, the relative position of the eccentric to the valve gear will be altered, impairing the proper sit of the valves, hence it follows that the wear of the crank bearing in this direction should be taken up (by raising the lower brass) before it becomes excessive. To find how much the bottom brass requires raising, or whether it requires raising or not, find the center of the crank shaft, and from this center strike the circle *B*, in Fig. 2, whose diameter must equal that of the crank pin *A*, and place the edge of a spirit level coincident with the perimeters of the crank pin and circle, as shown in the cut. When the bubble of the spirit level stands in the same position as it does when the level is placed upon the bore of the cylinder or along the piston rod, the crank will be in line with the cylinder bore.

bore and at the proper distance from its axial line, and the pillow block is made of the proper height, a line stretched axially true with the cylinder bore will pass through, or be equal in height from the engine bed with the center of bore of pillow block brasses; but the length of the cylinder being only about one-fifth of the distance from the cylinder to the center of pillow block, any error in the planing of the cylinder flange true to the cylinder bore becomes magnified five times at the pillow block, hence it is necessary to stretch a line through the cylinder bore and set the cylinder so that the line, being axially true with its bore, will pass the pillow block at the center of the bore of its brasses. This is sometimes done by inserting thin pieces of sheet tin, metal, or even paper beneath the cylinder flanges and the bed, and in the requisite positions. The method of stretching the line is shown

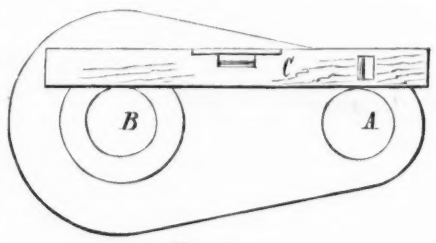


Fig. 2.

in Fig 3. *F*, is a device for holding the line at that end. It consists of a frame in the form of a cross, with adjusting screws at the end of each arm, and a small hole at its center to receive the line. The other end of the line *A*, must be secured, under as much tension as the line will safely bear, to a piece of wood clamped to the engine frame at *R*. The adjustment of the line is

pillow block, as compared to the length of the cylinder bore.

If the pillow block is planed on its bottom face and has its brasses fitted, the latter may be marked off for boring from the line *A*, Fig. 3, when stretched to set the cylinder, thus avoiding a second adjustment of the line *A*.

Suppose now that it is required to line the brasses in the pillow blocks, true, to be bored,

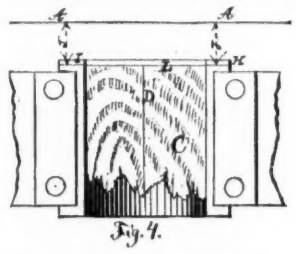


Fig. 4.

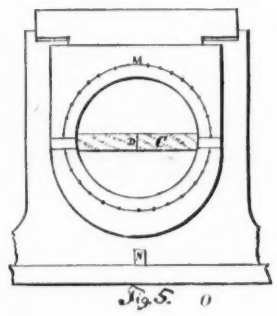


Fig. 5.

(the pillow blocks being bolted in position.) The distance of the face *B*, of the brass from the stretched line *A*, in, must equal the distance from the center of the length of the crank-pin journal, to the face of the large crank hub, and this distance may be shown by a line marked on the edge of the brass flange.

Pla e a straight edge *C*, having a line *D*, line of the bore at a right angle to *P*. If otherwise, two flat places should be filed on the brasses, as shown in Fig. 4, in which *C*, is the straight edge, and *A*, the stretched line as before, *H*, and *I*, representing the flat places whose distance from *A*, as shown at *J*,*J*, may be made to represent the thickness of the crank from its large hub face, to the center of length of crank-pin journal; hence, the depth of the flat places will show how much to take off the face of the brass to leave it of the proper thickness.

A straight edge placed across these flat places as denoted by the line *L*, must stand at a right angle to the line *D*, so that by setting the brasses by the flat places they will be bored to stand at a right angle to *A*. To set the brasses the other way a circle is struck from *D*, as a center, upon the faces of the brasses as in Fig. 5, in which the straight edge *D*, is shown wedged in the bore of the brasses, which is the most convenient way when it can be done.

The line *D*, is carried down on the end face of the straight edge, and the latter is used as a support for the compass points while striking the circle *M*, which is defined more clearly by indenting it with fine center punch marks. The height of the center for bore of brasses may be carried from the center line of the cylinder *A*, Fig. 4, to the end of the straight edge *C*, by placing another straight edge across the engine bed and measuring from the end of *C* to *A*. In Fig. 5, *N* represents the end of the latter straight edge, and *O* one side of the engine bed.

Suppose now that the brasses were bored, and the position of the pillow blocks were to be set, the process is the same, the line *D*, Fig. 4, being marked true from the bore of the brasses, and the pillow blocks moved until *D*, is at a right angle to *A*.

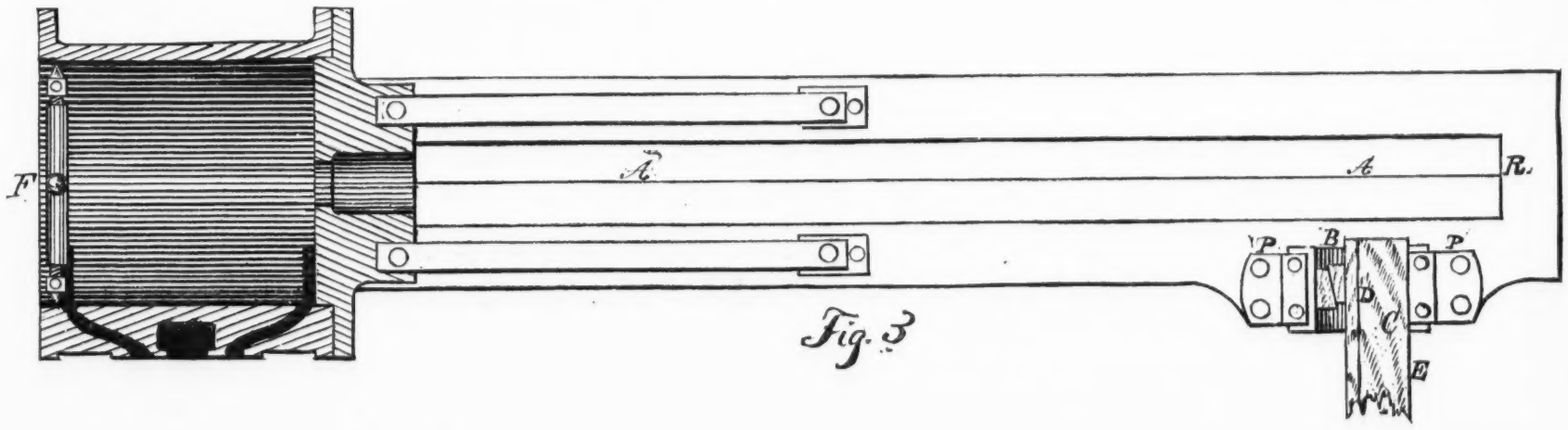


Fig. 3

As a rule, the cylinder bore of a horizontal engine stands horizontally true, and the crank center line should also stand so when the crank is on its dead center, but if such is not the case the crank center line must nevertheless stand true with the axial line of the cylinder, when the crank is on the dead center.

If, instead of having a Corliss frame and Field guide bars, the engine has a flat bed and adjustable guide bars, as shown in Fig 3, the operation is as follows: In setting up a new engine it is obvious that if the flanges of the cylinder are placed parallel with its

made by measuring its distance from the bore of the cylinder at one end and the bore of the gland hole at the other end, using a pair of inside callipers or a wire guage. The latter should be bent in its length to admit of adjusting the same by straightening to increase or still further bending to diminish its length to suit the requirements.

The wire, when applied, should only just meet or touch the line and not bear the least hard, or it will spring the line, causing an error of adjustment that will be serious when multitiplied by the length of the line to the

parallel with its edge *E*, so that this line will be in the center of the width of the pillow-block jaws, and at a right angle to the line *A*. The line *D* will then represent the axial line of the crank shaft, and may be used as the center from which to mark the lines on the brasses used to set them by for boring. To test if *A*, and *D*, are at a right angle, or to set *D*, to *A*, a large square should be used. If the side face *P*, *P*, of the pillow block stands parallel to *A*, as it should do, when it is true, it will serve to chuck the pillow block by, thus boring the brasses in their places, with the center

In the suit of The Pope Manufacturing Company, of Boston, against McKee and Harrington, of New York City, for infringement of the patents belonging to said company, relating to bicycles and velocipedes, the court, after a full hearing, has ordered an injunction to issue against McKee and Harrington for their infringement of said patents, restraining them from manufacturing or selling bicycles.

This decision settles the question as to the validity of those patents controlled by said Pope Manufacturing Company, and gives said company the sole and exclusive control of the manufacture and sale of all bicycles or velocipedes now in common use.

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NEW YORK, OCTOBER 30, 1880.

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The Shipping Convention at Boston.

That a thoughtful conference of representative men upon a subject so important as the restoration of American shipping to its proper place in the world's business, is an event to be chronicled, there can be no doubt. That the result of its deliberations should prove to be so barren and misguided is an event to be deplored.

In voting down the proposition to allow the free transfer of half the maritime old junk now afloat to nominal American ownership, the convention acted wisely, as beyond tickling the national pride by a barren statistical display, no valuable national gain could be the outcome of this policy.

In voting to favor the granting by the government of a direct subsidy to owners (not builders) of American ships, the convention assumed a position which is totally indefensible upon any rational view of either theory or practice, and one which should be opposed to the end by every American.

The builders of both iron and wooden ships, present in the convention, disclaimed the need of any protection to themselves, as ship builders; the ship *owners* being the persons who were in need of aid.

Now, why should a capitalist who wants to engage in the business of sending vessels to foreign ports receive a direct money bonus from the Government, any more than the user of lathes or planers? It is true that American shipping interests are down, and need some outside influence to enable them to get up again; but the method suggested by this convention, differing, as it does, from that of a protective tariff, as practised in this country, would tax the general public without even accomplishing the results sought for. It has already been well demonstrated in this country that the corporation which receives a direct subsidy from Congress, for a term of years, is already half ruined. The inevitable result of such legislation would be, that within a year or two from the time the subsidy was granted, half of it would have to be devoted to lobbying, for its retention or its renewal. Congressional lobbyists would get the money, and the public would pay the bill. Direct subsidies of whatever character, or however managed, lead to direct abuses, whose weight can neither be palliated nor evaded.

What is wanted is a means of aid, which will fill American ship yards with work; and, by the creation of new property, repay the American people for aid rendered. But this assistance there is one means of rendering, and only one, without departing from sound protective principles, or opening the door to lobbyists in and out of Congress.

Enact a law, that, beginning, say, two years after the date of its passage, the Government, which is already in the business of providing mail facilities for its citizens, shall receive no proposals for rendering such services, either at home or abroad, from other than owners of American built ships, and the problem is solved. Within that two years, the skill of American builders and the cash of American capitalists would give us a line of American steamers to every prominent port in the world, and the government would find itself, within a few years, in position to receive competing bids for carrying the ocean mails from Boston, New York, Philadelphia, Baltimore, New Orleans and San Francisco Steamship Companies, at figures not greatly higher than it now pays to English, French and German Companies, for the same service. The tremendous impetus thus given to iron ship-building interests would inevitably redound to the advantage of those owners and builders of wooden ships, who do not promptly take the hint, stop the futile attempt to fight the nineteenth century, and convert their yards into manufactories of iron vessels.

The United States will not allow any man but a native born citizen to be President. Why not also enact that the mails shall be carried only by vessels built and owned in America ?

The November Meeting of the American Society of Mechanical Engineers.

We have been requested to announce that Prof. John E. Sweet has been invited by the council to read the first paper read before the American Society of Mechanical Engineers, at the first meeting for the reading of papers, on November 4th next. No regular reader of the American Machinist needs to be told that this compliment is paid to its recipient,in view of the eminent services rendered by him to the society, in the work which culminated in the organizing meeting held in the office of the American Machinist on February 16th last. That the first paper read before the society will be a good one, no one who knows its author can doubt.

We are informed that a number of valuable papers are already announced as in course of preparation for the November meeting of the society. It has been suggested, in view of the general interest manifested in the society's prospects, that the general public be invited to attend the meetings at which papers are read. The suggestion is a wise one, and should be promptly carried out by engaging a convenient room for the purpose in some building like the Cooper Union.

A Shop Library.

We have occasionally referred to the establishment of shop libraries for the use of workmen, and have referred specifically to one, at least, which has been productive of excellent results. In the autumn of 1868, the Brown & Sharpe Manufacturing Company purchased a library of about 150 volumes, for the free use of their workmen. The collection has been gradually increased until it numbers at the present time some 700 volumes. The experiment was undertaken by this company, with the expectation that the amount expended for establishing and maintaining a library would be more than made up by the increased practical knowledge of their men, resulting from judicious reading. Experience has proved that they were not mistaken, and within a few weeks new and commodious cases have been constructed in their works, to afford facilities for further enlargements of the library, and its still greater usefulness. The regulations, which are printed and furnished to every employé who desires to avail himself of reading privileges, are as follows:

Sec. 1. Any person in the employ of the Company, is entitled to the use of one volume for two weeks. At the expiration of this time, it may be renewed for one week.

Sec. 2. If at the expiration of two weeks the volume is not returned, or renewed, or at the expiration of three weeeks it is not returned, a fine will be imposed of two cents for each day's detention.

Sec. 3. If any person shall lose or deface a volume, he shall be charged a sum equal to the value of the same.

Sec. 4. No person taking books from the Library can be permitted to loan them.

Sec. 5. Books in the possession of persons leaving the employ of the Company, must be returned before settlement is made.

Sec. 6. The Library will be under the charge of the Time-keeper, who will deliver books at the regular periods as indicated on the library bulletin.

The library is open for obtaining books every Friday afternoon at six o'clock—that is, at the close of the working day. We are informed that,on an average,fully one quarter of the men engaged in the works take out and read books. In the winter the proportion of those who read is larger than it is in summer. In looking over the shelves we noticed a good sprinkling of books on subjects of general interest as well as purely technical treatises. Biography and history are well represented, also books of geography and travels and bound volumes of periodicals. A complete set of *Harper's Magazine* from the first number issued has attracted more readers, we are informed, than any other publication in the library. The works of Dickens and Scott are conspicuous on the shelves. Among other works we noticed Chambers' Miscellany, 10 volumes; Chambers' Papers for the People, 6 volumes; Chambers' Journal, 20 volumes; Shakespeare, 8 volumes ; The Rambler, 4 volumes, and several volumes of poetry. "Things Not Generally Known" is the suggestive title of one book. As might be expected, works on mechanical subjects are liberally interspersed. Apprentices show a leading taste for stories, also biography and history. Workmen engaged on special jobs can find books in the library containing information applying directly to the work in hand.

The object of the library is not to furnish the men with all their reading matter, but rather to induce a taste for reading. We commend the plan of establishing a library to other proprietors of machine shops.

A few days since the corner stone of the foundation for the Egyptian obelisk, recently brought to this country, was laid with appropriate ceremonies in this city. The project of bringing this ancient monument to New York City had its origin in a suggestion of Mr. Louis Sterne, an American mechanical engineer long resident in London, England, to Mr. Hurlbert, editor of the *World*, in October, 1877. This suggestion was immediately given to the public, through the columns of that newspaper. A question arose as to how the large cost of transporting the obelisk here should be defrayed. A wealthy American citizen volunteered to give $75,000 for its transportation and erection in this city. The enterprise was finally undertaken by Lieut.-Commander H. H. Gorringe of the U. S. Navy, to whom belongs the credit of the success of the enterprise. To Mr. Sterne undoubtedly belongs the credit of setting this enterprise on foot, and enabling us to possess one of the finest ancient monuments in existence.

One of the publishers of our valued contemporary, the *Sanitary Engineer*, has just returned from Europe, whither he has been to enlarge the scope of the paper, by engaging new contributors and correspondents, and arranging for the increased circulation, which it so well deserves. He informs us that the American Machinist greeted him with all the cordiality of an old friend, at many points in his pilgrimage.

We are again obliged to ask the indulgence of our readers for the continued inroads made by advertisements upon the space, which, ever since the paper was founded, it has been our aim to reserve for reading purposes in the American Machinist. For the third time during the past year, the pressure of advertisements, largely unsolicited, upon our limited space, has compelled an advance in our advertising rates. The present advance will take effect Oct. 25th, on all contracts made on or after that date. It is our intention to keep the paper always of one uniform size, viz., 16 pages. Our readers need not be informed that our circulation is constantly increasing, as the evidence is visible to most of them.

The 150th anniversary of the foundation of the city of Baltimore is an interesting event of the week. The mechanical and commercial progress of the city during the term of life thus marked, will doubtless afford but little clue to that which the next fifty years may be expected to furnish.

The recent accident on the New York Elevated Railroad, by which an engineer lost his life, was directly due to the negligence of the company. In a dense fog the train ran into the one before it, smashing the engine and scalding the engineer so badly that he lived but a short time after the collision. The trains should be run by telegraphic signals like those on the London rapid-transit roads. On these lines a man is located at each station to attend entirely to signals. As soon as a train moves off he touches a telegraph key and a gong strikes at the next station behind, which is the notice for the train standing there to go

ahead. An engineer never starts his train from a station until he hears the signal giving notice that the train has left the next station on the route, thus leaving the way clear. About all the expense this necessary precaution would incur for the Elevated Railroad company would be the wages of an additional man at each station on the line.

Those of our readers who prefer riding to walking, and consider a horse which only eats when in use, more desirable than one which must be fed three times a day, will be interested in the Steam Buggy illustrated and described on our first page by F. G. Woodward. It opens up an interesting chapter in locomotion, the possibilities of which have been little explored.

Literary Notes.

THE WAR SHIPS AND NAVIES OF THE WORLD; containing a complete and concise description of the construction, motive power and armaments of the war ships of all the navies of the world. Naval artillery, marine engines, boilers, torpedoes, and torpedo boats. By Chief Engineer J. W. King, of the U. S. Navy, author of King's Notes on the Steam Engine, 1 vol., 8 vo., 500 pp, and 64 full page illustrations; price, $7.00. Published by A. Williams & Co., Boston, Mass.

This book commences with historical sketches of the origin and progressive improvement in the navies of different nations from the time of Cæsar's campaigns, down to the present. When armed sailing vessels only were used, the successful naval engagement between war ships depended largely upon the skill of their commanders as navigators. Improvements have been gradually introduced until skilled navigation is left almost entirely out of the question, sailing vessels have been abandoned, and naval battles may now be said to be "fought by steam." A modern iron clad is a mass of machinery. The propelling power is steam, the steering is done by steam, the guns are loaded and handled by steam, and, in fact, everything to be done on board the ship is performed by steam. Hydraulic machinery is also much used. In 1877 and 1878, the author made reports to the Government, containing the results of his investigations of vessels and equipments of European navies during his tours abroad.

These reports were published and distributed. The edition has been long since exhausted, and the most valuable portions of those reports are contained in the present work, together with much that is new.

The book is written in a style which is not only interesting to engineers, but equally as much to the general reader, and will be easily understood. The author describes the radical changes which have been made in war vessels, and upon which enormous expenditures have been made during the past few years.

The description of torpedo warfare which is now occupying the minds of scientific men of all nations is exceedingly interesting. In referring to the different vessels, the author gives the dimensions of each and then enters into a detailed report upon the same. The tabulated data are very valuable, and enables the reader to form an idea at once in regard to the value of the plans and systems referred to. The data referring to tests of the engines, which embraces both the simple type and the compound principle, used in the different vessels, will be highly appreciated by practical engineers The subject of naval artillery, armor, construction and tests of the same, embody the latest improvements, and are very exhaustive. The engravings are very neatly executed, and are figured where referred to in the manuscript, which is also neatly and plainly printed.

We congratulate the author in this very valuable addition to scientific literature, and commend it to our readers as a book well worthy of their attention.

We have before us some exquisite specimens of Christmas cards, engraved on steel by John A. Lowell & Co., 21 Exchange Place, Boston. They present different views and are made of different sizes.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1.) G. B., Buffalo, N. Y., asks: Will you please inform me if there is a patent agency connected with the Cooper Institute? *A.*—There is no patent agency connected with the Cooper Institute, but an addition has been lately made to the building a part of which is said to be for the purpose of accommodating an Inventors' Institute or museum of patents.

The object is to exhibit patented articles and processes, which will aid inventors in disposing of the same.

(2.) A. R. H., Elgin, Ill., writes: Please inform me why the Knowles Steam Pump makes that twist in the stem of the upper steam valve. Your answer will decide an argument. *A.*—The twisting stem alluded to, is attached to a piston valve which has small ports cut into the sides of it. When the steam piston has nearly reached the end of its stroke the forks upon the valve stem are twisted by the projections upon the arm attached to the piston rod. By this means the small ports in the piston valve are brought opposite each other, and allow the steam to escape from one end while they admit steam to the other. This compels a longitudinal movement of the piston valve, which draws the main valve along with it thus opening the ports for admitting steam to the large steam cylinder. This operation takes place at the end of each stroke.

(3.) J. H. P., Nashville, Tenn., asks: What is the nature of the "Adiabatic curve" mentioned in answer to 4th question in your issue for October 9th, 1880? *A.*—The Adiabatic curve was fully described, also a method given for generating the same in an article entitled "Engineering Popularized," by Wm. Lee Church, which appeared in the AMERICAN MACHINIST for March, 1879.

(4.) W. H., Sharon Station, N. Y., writes: I am making a foot lathe. The diameters of the cone on the lathe spindle are 3″, 4½″ and 6″. I want to make a driving wheel of 30″ diameter, that is, the step that will drive the 3″ pulley on the lathe spindle. What must be the diameters of the other two steps on the driving wheel, so that the belt will run with the same tension upon the 4½″ and 6″ pulleys as upon the 30″ and 3″ pulleys? I read your answer to M. H. P. in the AMERICAN MACHINIST, for November 15th, 1879, wherein he asks for a formula for obtaining correct size of cone pulleys, so that each speed would use same length of belt, allowing the pulleys to be of equal size or of different diameters. I tried the formula and found it did not work, for a belt would not run upon the pulleys made according to the instructions given, as it was slack upon some and tight upon the others. What is the reason for this? *A.*—The formula referred to by you will do very well, and is approximately correct where cones are made of an equal size or nearly so. By making one cone larger than the other the discrepancy increases so that a belt will not run with an equal tension as in your case. To figure out the proper sizes for the steps on the driving cone involves the use of complex formulas, which will have to be changed as the distance varies between the centers of the cone. The proportions which will be right with the cone 3 feet apart will not do if they are a greater or less distance. The following is a good practical and reliable method of laying out a cone to transmit power to another where the diameters of the cone are not alike. Take, for example, the cone upon your lathe the diameters of which are 3″, 4½″ and 6.″ Upon a drawing board with a pair of dividers, and from the same center, describe the circles representing the different diameters of the cone, viz.: 3″, 4½″ and 6″ It must then be determined how far the cones are to be placed apart from center to center, and their position located upon the board. With a pair of dividers, using the new point as a center, describe a circle (which in this case is 30″, representing the largest diameter, although it might be the smallest or intermediate, and use the same principles). A row of common pins should now be stuck fast upon the line representing the 3″ circle, also the 30″ circle, one-half of the circumference being sufficient, and a fine wire representing a belt placed upon the outside of the pins with a fair tension. We now place pins upon the the 4½″ circle in the same manner, and strike a circle within the 30″ circle of such a size, that when pins are placed upon it the tension of the wire belt will be the same as upon the 3″ and 30″ circles. The size corresponding to 6″ circle may be laid out in same way, thus giving at once, and without the use of figures, the correct diameters for the driving cone. Where the cones are very large they may be laid out a half or quarter size. 2.—Can I cast a small brass cylinder in a mould made of plaster of Paris. Also, can I use plaster of Paris for cores for the bore and steam ports, and can cast brass be melted on a blacksmith's forge? *A.*—Plaster of Paris is a very poor material for moulds in which to cast metal, on account of its peculiar properties to absorb dampness, so that when the metal is poured into it the casting will be full of blow holes. It is equally objectionable for cores, as a core should be well ventilated. An excellent article on "Casting Small Cylinders," by V. Hook, was published in the AMERICAN MACHINIST for August 30th, 1879. This article will give all the information required to mould small cylinders. Brass may be conveniently melted upon a blacksmith's forge, by laying bricks about the crucible and covering the top with a sheet of iron in order to get a uniform heat. The metal may be melted without these precautions, but they will repay the extra trouble by insuring a better casting and a more uniform quality of metal.

Business Specials.

40 cts. a line for each insertion under this head.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Thomas D. Stetson, Patent Solicitor and Expert in Patent Cases, No. 23 Murray Street, New York.

American Watch Tool Co., Waltham, Mass., Whitcomb Watch Makers' Lathes, and Watch Machinery.

See Standard Turbine advertisement in last issue.

A 4¼ in. 2 Jaw Chuck, Independent or Universal, for Brass Work. A. F. Cushman, Hartford, Conn.

Cylinders, all sizes, bored out in present positions. L.B. Flanders Machine Works, Philadelphia, Pa.

Paper Making Machinery—Makers of above from fibrous material as wood, esparto grass, etc., send address to Joshua Rose, P. O. Box 3306, N. Y. City.

Rules for Engineers, and Removal of Scale in Boilers. Send for Circular. Ranken Scale Co., 50 Federal Street, Boston.

Dixon's Traction Belt Grease. Dixon's Founders' Perfect Wash. Dixon's Plumbago Foundry Facing. Dixon's Graphite Machine Grease. Dixon's Everlasting Graphite Axle Grease. Dixon's Dry American Graphite Perfect Lubricator. Send for explanatory circular to Dixon Crucible Co., Jersey City, N. J.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, D. Appleton & Co, New York, or the author, Manchester, N. H.

Sheet Metal Presses. Ferracute Co., Bridgeton, N.J.

Engines Indicated—Power Measured. W. H. Odell, Box 274, Yonkers, N. Y.

John Douglass, common and fine patterns made to order, also car wheels, working models, and experimental machinery. Shop at Washburn, Hunts and Co's Wheel Foundry, cor. Warren and Bay Sts., Jersey City, N. J.

A. J. Emery, Mechanical Engineer and Draughtsman, 7 Courtlandt Street, New York.

Blowers for all purposes. Exeter Machine Works, 50 Federal Street, Boston.

MANUFACTURES.

The Bradley Cushioned Helve Hammer, made by Bradley & Company, of Syracuse, N. Y., was awarded the first prize silver medal at the Cincinnati Industrial Exposition just closed. The demand for these hammers is rapidly increasing, and the company are compelled to run their works to their full capacity to keep up with their orders, which average about twenty per month.

William Wright, Newburgh, N. Y., is pushed with orders for steam engines. Among those now building we noticed one of 500 horse power (compound) for L. Waterbury & Co., Brooklyn, N. Y.; another of 500 horse power (also compound) for the Dalton Mills, Paterson, N. J.; a pair of engines for Brush Electric Light Company, Cleveland, O., one 18×42 inches and the other 20×42 inches.; one 20×36 inches for Hempy & Co., Cleveland, O.; one 16×36 inches for Hanmer, Forbes & Co.; one of 22×42 inches for Bibb Manufacturing Company, Macon, Ga., and one new style for Toy, Bickford & Co., Simsbury, Conn.

The Porter-Allen Steam Engine Works (Southwark Foundry and Machine Company) are full of orders for high speed engines. One has just been set up in the Bessemer Steel Works, Troy, N. Y., 22×36 inches, which will make 200 revolutions per minute.

The Billings & Spencer Company, Hartford, Conn., have declared a quarterly dividend of two per cent., payable immediately. They are crowded with orders for drop forgings, wrenches, ratchet drills, lathe dogs, etc.

The Augusta Factory, Augusta, Ga., has placed its order for some 13,000 ring spindles at the Lowell Machine Shop, with other machinery.

The Betts Machine Company, machine tool builders, Wilmington, Del., report business as very good. They are just completing two planing machines for the Pennsylvania Steel Company, Harrisburg, Pa., made with steel gearing throughout, to do the very heavy work required on their steel railway forgings. They will also ship, in a few days, two planers, same size as above, to the Union Steel and Iron Company, Chicago, Ill., for the same purpose. The demand for their new improved cutting-off machines is so great that they have been unable to keep up the supply, but are now arranging to increase the production. Bridge-builders' tools also sell freely, and on the whole, they think the outlook very encouraging.

The Readfield Mfg. Company, of Readfield, Me., are making quite extensive improvements in their woolen mill.

They are building a new dye house, and in connection with this a boiler house for the 40 H.P. boiler recently purchased of the Whittier Machine Company, Boston. This boiler is to supply steam to the mill which is being thoroughly piped for heating in winter, and in summer will supply power through an engine to drive the machinery during dry seasons, on account of which they have had to shut down the greater part of the past summer. Fred. Hartwell is the treasurer and financial manager of the company, and Daniel Whitehouse, selling agent; both men of business sagacity and enterprise.

The Cope & Maxwell Mfg. Company, Hamilton, O., have just shipped to The Desloge Lead Company, of St. Louis, Mo., for their mines in St. Francois county, Mo., two vertical long connected plunger pumping engines, fitted with Cope & Maxwell's patent "Isochronal self-governing" "valve gear." The steam cylinders are each 20 inches in diameter, 30 inches stroke. The pump plungers are each 10 inches in diameter, 30 inches stroke. The steam cylinders and pumps are securely connected together by heavy cast iron columns, the whole structure weighing 12 tons. They are very busy and working over time on mining and waterworks machinery.

The Illinois Secretary of State has issued a license to Thomas J. Grash, Clarence C. Mulford and Hugh R. A. Walker, as the Streator Spark Arrester Manufacturing Company; object, to manufacture locomotive spark arresters. Capital, $5,000; location, Streator.

An oleomargarine factory is in course of construction in Albany, which, when finished, will turn out between 6,000 and 8,000 pounds of the article daily.

The Vulcan Iron Works, New Britain, Conn., are erecting a new foundry 100x50 feet, one story high. Their special line is malleable iron castings.

The Hartford Machine Screw Company are building a new factory, with a capacity of running 600 automatic screw machines, for the manufacture of all grades of machine screws, from the size used in watches to the size used in the heaviest work. The structure will cover a space of 300 by 200 feet, will be built of brick and stone, and is made as nearly fire proof as is possible. The machinery will be driven by a pair of Browns engines of 125 horse-power each. It is expected they will be running about the 1st of December.

The Fairbankses contemplate enlarging their scale works at St. Johnsbury, Vt., one-third.

The Ashcroft Manufacturing Company, Boston, have just received an order from Nichols, Shepard & Co., builders of farm engines, Battle Creek, Mich., for 400 of their improved steam gauges with 5½-inch cases. They are to be made with nickel ring and seamless drawn tubes. They also have an order for 400 patent "pop" safety valves from the same concern, and another order for 150 steam gauges from D. June & Co., Fremont, Ohio.

J. E. Tisdele, Homer, N. Y., is putting in his flouring mills one of Woodbury, Booth & Pryor's automatic cut-off 10″×15″ engines.

A firm from Cedar Rapids, Iowa, are contemplating the establishment in Yankton, D. T., of a factory for the manufacture of iron fences, plows, wagons, etc.

Henry C. Fish, of the firm of H. C. Fish & Co., Worcester, Mass., manufacturers of iron doors, shutters, etc., is building an addition 94 feet front by 35 deep, and two stories high.

The *Philadelphia Trade Journal* states that Mr. Charles H. Cramp says that the project of forming a company with a capital of $10,000,000, to build and equip iron excursion boats between New York city and the various accessible summer resorts, means business. The Messrs. Cramp will obtain contracts for building several of the nine steamers which are contemplated.

Edwin A. Hopkins, Lucius L. Spring and others have filed papers incorporating the American Water Works Construction Company in Chicago with a capital of $1,000,000.

The Cleveland Co-operative Stove Company have got to work at their new establishment in this city, several heats of metal having been successfully and satisfactorily run during the current week. It is contemplated to make the capacity of these works such as to supply all of the demands made upon the company from this section of country, and not draw upon the parent works at Cleveland.—*St. Louis Age of Steel.*

Machinists' and Engineers' Supplies.

NEW YORK, October 14, 1880.

During the past week business in the supply market has fallen off a little, which is possibly largely owing to the deep interest taken in politics. But there is a fair business being transacted notwithstanding the complaints of a few dealers. Prices remain firm and the outlook is very encouraging.

The Providence Tool Co., of Providence, R. I., are introducing a new article in the way of machinery nuts, which are extra trimmed, chamfered, and the holes are drilled by a special process which renders the holes free from the scale which is so destructive to taps. So far as we know these are the only nuts in the market having drilled holes, and are furnished at about 2 cents per pound more than the ordinary hot-pressed nuts.

The Billings & Spencer Co., of Hartford, Conn., are now manufacturing a new and efficient Combination Capper and Recapper, used for shot guns. There are at present two sizes made, 10 and 12 gauge. The instrument closely resembles a bell-punch, having two handles. Upon the top is a hollow receptacle, with a swinging cover, which holds the caps or primers.

Rankin, Brayton & Co., proprietors of the Pacific Iron Works, San Francisco, Cal., have just issued a new catalogue and pattern list. This catalogue contains illustrated descriptions of engines, boilers, mining and mill machinery and appliances. It also contains much valuable practical information.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling Slip, New York, furnish us the following, under date of Oct. 14, 1880:

A decidedly stronger feeling pervades the Metal Market. Pig Tin in London, £87.10s; Singapore, $27. Would quote this market: Banca Tin 25c.; Malacca and Straits 20 to 20½c.; Australian, 20c.; Billiton, 19¼c. "Lamb & Flag" 19¾c.; Pig Lead, 5c. to 5¼c.; Antimony, 15c. to 16c., as to brand. Spelter, Domestic, 5½c.; "Bertha," pure, 8c. to 8½c.; Silesian, 6c.; No. 1 Solder, 11c.; "Half and Half," 13c.; Bismuth, $2.50 to $3.00.

Iron Review.

NEW YORK, October 14, 1880.

The transactions in the iron market are small and of no special importance. There are no changes in values. We continue to quote Foundry No. 1, at $25. Foundry, No. 2, $20. Grey Forge $19.50@$20.50. Manufactured iron also remains the same as last reported.

We quote as follows:

American Iron Rails, $50 to $53, according to weight; Fish Plates, 2¾c. per lb.; Railway Spikes, 3¼c.; Bolts and Nuts, 3½c.; Common Bar Iron, 2.4c., basis from store, Refined do. 2.6c., basis; Ulster, 36-10c. basis; Machinery Steel, 6½c.; Best Tool Steel, 13½c.; Norway Bar Iron, 6¼c.; Norway Shapes, 6¾c; Nail Rods, 6¾c.; Sheet Iron, 3½c., basis; Angle Iron, 2¾c.; Tee Iron, 3¾c.; Band Iron, 3 2-10c.; Hoop Iron, 3.6c., and up according to size; Horse Shoe Iron, 3 2-10c.; Hot Polished Shafting in lengths, 2 ft. and longer, 9 to 10½c., according to size; Small Black Rivets, 30% off in papers; 10% off in bulk.

Carmichael & Emmens, 130 Cedar St., New York, quote prices of Boiler Makers' Supplies from store as follows:

Flange Iron	5¼
C. H., No. 1, Shell Iron	4¼
C. No. 1 Iron	4
Tank Iron	3¾
Sheet Iron	3½
Angle Iron	3½
Bead Iron	5½
Burden Boiler Rivets	5 1-10

Boiler Tubes at 40 per cent. discount off list.

WANTED.

Wanted—Machinists—Six strictly first-class Vise hands and Fitters accustomed to building machine tools; liberal wages paid by Niles Tool Works, Hamilton, Ohio.

A young Swede, graduated from Technological Institute, with experience as draughtsman in marine engine works, desires a position as draughtsman. Address Swede, P. O. Box 964, Fitchburg, Mass.

The advertiser has had long and successful experience in the design and construction of machinery and shop management; is of middle age, and thorough business habits; will be open for an engagement early in 1881, and solicits correspondence. Address B., office of AMERICAN MACHINIST, 96 Fulton Street, New York.

Wanted.—A reliable second hand Richards Indicator. Address with price and particulars, C. W. N., office AMERICAN MACHINIST.

A first-class Machinist wishes a situation; is well acquainted with pipe foundry crane work. Address A. C., Box 280, Bordentown, N. J.

T. NEW'S PREPARED
ROOFING.
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 38 John Street, New York.

BEECHER & PECK,
(Successors to Milo Peck),
Manufacturers of
PECK'S PAT. DROP PRESS.
Peck's Drop Lifter the only one that has its parts cushioned.
Send for illustrated Catalogue.
157 Temple St., New Haven, Conn.

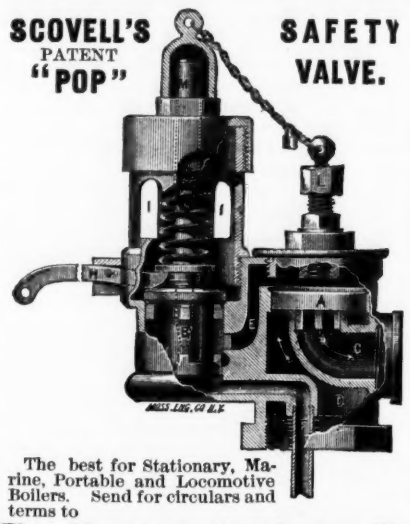
A PARTNER WANTED.
The undersigned is proprietor of an extensive machine shop, foundry, blacksmith shop, &c., in Fond du Lac, Wis., stocked with first-class Tools, among which is a Planer for planing 20 feet long, 4 feet wide and 4 feet high, made by the Putnam Machine Co., also a Lathe of 7 feet swing and 20 feet bed, made by the same company. *The shops and Tools are nearly new*, and now running on Engines, which it is intended to make a specialty of manufacture, but owing to the pressure of other business the proprietor is *unable to give his personal attention* to the same, and, therefore, wishes to associate with himself a practical business man of experience in this line to take charge of the business, and who could also furnish a portion of the capital required. The business is free from all indebtedness, and the principal part of the capital necessary for operating the works can be furnished by the present proprietor. Address,
CHARLES J. L. MEYER, Fond du Lac, Wis.
September 25, 1880.

WILLIAM COOKE,
(Successor to COOKE & BEGGS),
6 Cortlandt Street, New York.
AGENT FOR
The Waters Perfect Governor,
Having Adjustable Speed, Automatic Safety Stop, Sawyer's Lever, and Solid Composition Valves and Seats.

ALSO, DEALER IN
SUPPLIES
For Machinists, Railways, Mills, Mines, &c.
Please send for circular and state that you saw the advertisement in this paper.

ANEMOMETERS OR AIR METERS
For measuring the velocity of air currents in mines, sewers, hospitals, etc. Instruments of precision used in civil and mechanical engineering imported and manufactured by
JAMES PRENTICE,
164 BROADWAY, NEW YORK.

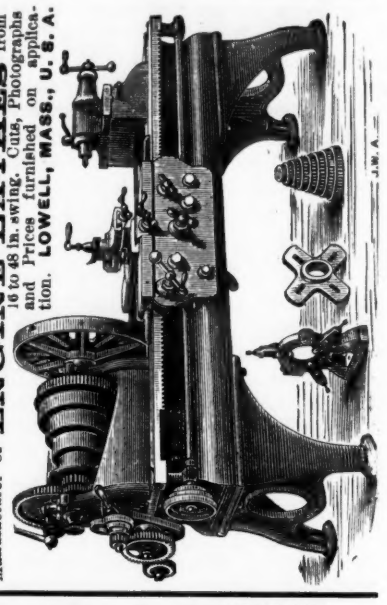
SCOVELL'S PATENT "POP" SAFETY VALVE.



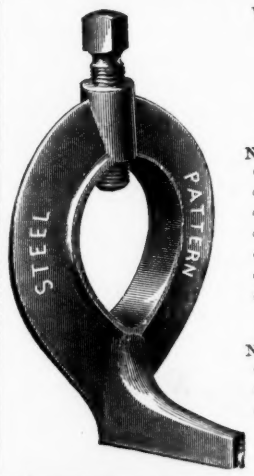
The best for Stationary, Marine, Portable and Locomotive Boilers. Send for circulars and terms to
The Hancock Inspirator Co.
34 Beach Street, Boston, Mass.

PRENTICE BROTHERS,
Manufacturers of
Machinists' Tools, Engine Lathes,

GEO. W. FIFIELD,
Manufacturer of ENGINE LATHES from 16 to 48 in. swing. Cuts, Photographs and Prices furnished on application. LOWELL, MASS., U. S. A.



C. W. LeCOUNT,
South Norwalk, Connecticut,
Manufacturer of
LeCount's Improved Steel Dog



With hardened Steel Screws turned in the Lathe.

PRICES.

No. 1....	⅜ in...	$ .40
" 2....	½ "	.50
" 3....	¾ "	.60
" 4....	1 "	.70
" 5....	1⅛ "	.85
" 6....	1½ "	.95
" 7....	1¾ "	1.10
" 8....	2 "	1.20

SMALL SET, $6.30.

No. 9..	2½ in....	1.40
" 10..	3 "	1.60
" 11..	3½ "	1.80
" 12..	4 "	2.00

FULL SET, $13.00.

KEARNEY & FOOT
Office, No. 78 Chambers Street, N. Y. — **Full Weight Hand-Cut Files.** — Manufactory, PATERSON, N. J.

The best and cheapest in the end. Send for quotations. The files speak for themselves in the following testimonials. Read them.

THE SINGER MANUFACTURING CO.

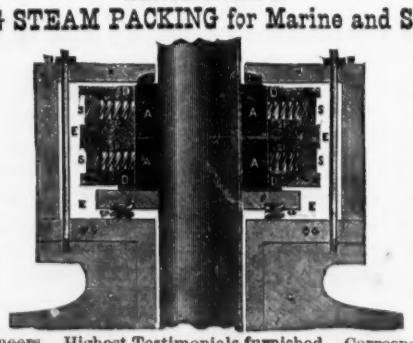
Messrs. KEARNEY & FOOT, Elizabethport, N. J., July 9th, 1877.
Dear Sirs:—We have for the past ten years used the Files of your manufacture, and during that time we have never had any fault to find with them. We can safely affirm that for evenness of temper, sharpness of cut, accuracy of shape and all other qualities which go to make up a perfect File. They are equal, and in some respects superior, to the best English-made Files. Very Truly, WM. H. INSLEE, Contractor.

Messrs. KEARNEY & FOOT, Elizabethport, N. J., May 3rd, 1877.
Gentlemen:—We have been using your Files, both new and re-cut, for several years, and take pleasure in saying that we have found them a very superior article.
HANS REISE, Contractor, with The Singer M'f'g Co.

We print instructions on the use of Files, and also give the diameters of round and square Files from 3 to 16 inches. They are on card board, 10x12 in., and are intended to be put up in the shop for the men to read. We are pleased to mail them to any manufacturer on receipt of the necessary 6 cents postage.
Respectfully, KEARNEY & FOOT.

UNITED STATES METALLIC PACKING CO.
MANUFACTURERS OF
SELF-ADJUSTING STEAM PACKING for Marine and Stationary Engines.
PATENTED.
February 10th, 1863.
March 7th, 1871.
October 8th, 1872.
April 21st, 1874.
Other Patents Pending.

SECTIONAL VIEW.



A A—Packing Blocks.
C C—Ring enclosing Blocks
D D—Projections for Springs and Set Screws.
E E—Space for Vibration.
F F—Follower.
G G—Cylinder Head.
S S—Set Screws.
S B—Stud Bolts.
J.—Ball Joint.
O G—Gland.
S P—Springs.
X X—Case.
R—Rod.
S—Set Screws.

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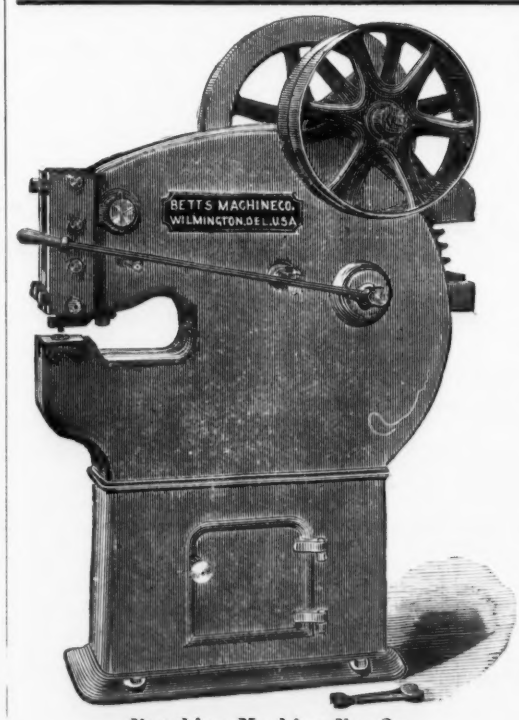
EDW. CUNNINGHAM, President.
JOSIAH A. OSGOOD, Superintendent,
85 Devonshire Street, Boston, Mass.
C. H. JACKSON, General Agent,
34 Coal & Iron Exchange, New York.



Punching Machine No. 2.

Betts Machine Co.
WILMINGTON, DEL., U. S. A.
BUILDERS OF
Boring and Turning Mills,
Cutting-off Machines,
Car Wheel Borers,
Axle Lathes,
Planers,
Drills, &c.
Shapers,
Slotters,
Boring Bars,
Bending Rolls,
Shaft Straighteners,
Punches and
Shears.
Send for List of
TOOLS ON HAND
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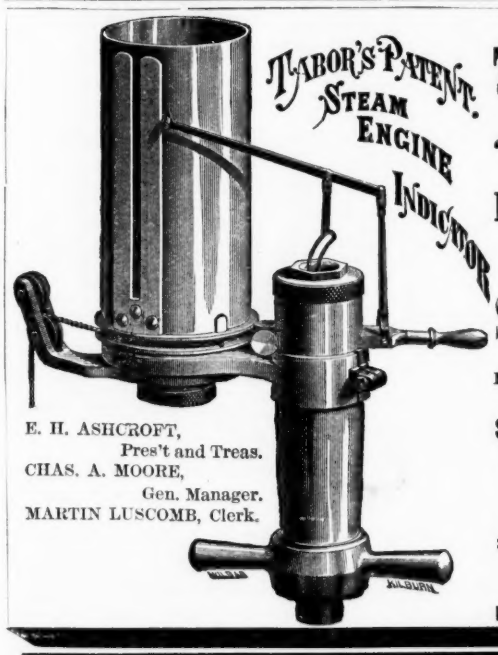

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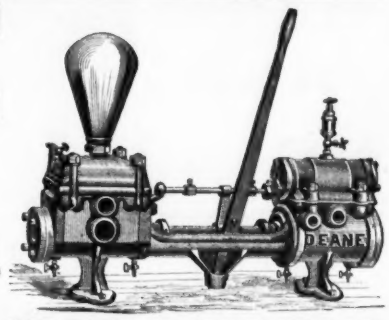

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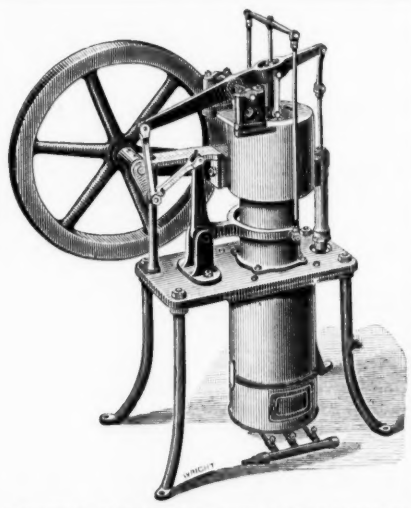

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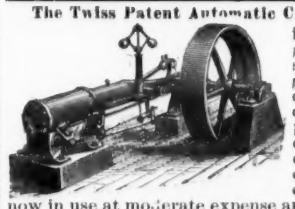

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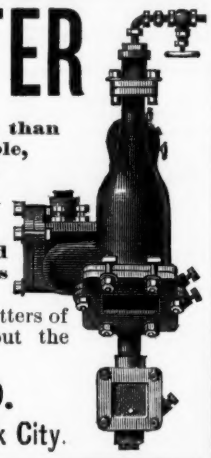

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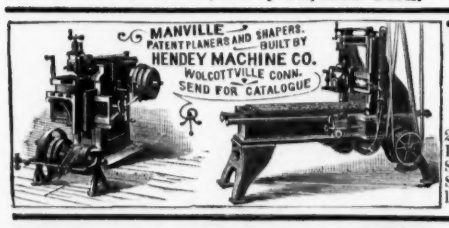

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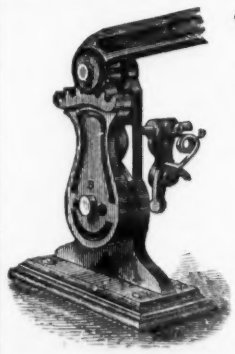

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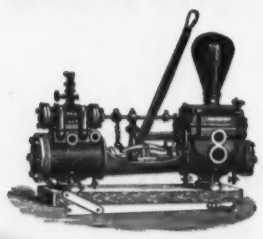

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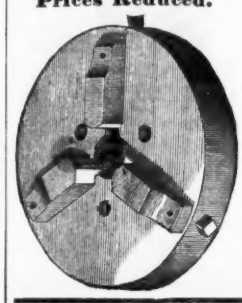

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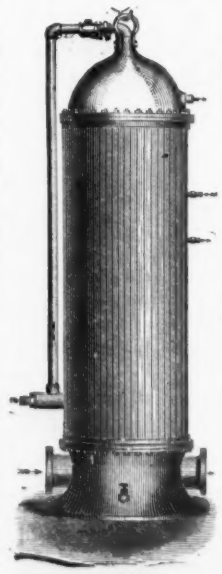

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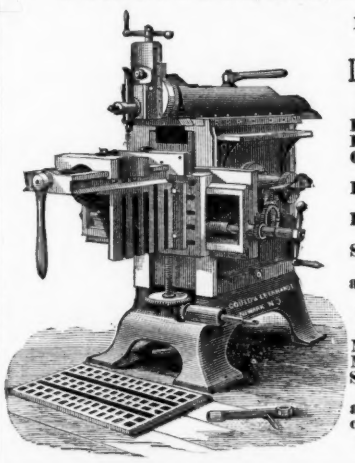

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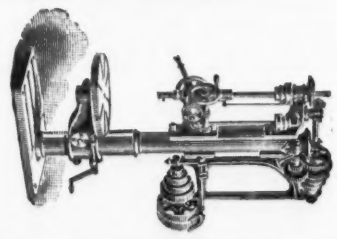

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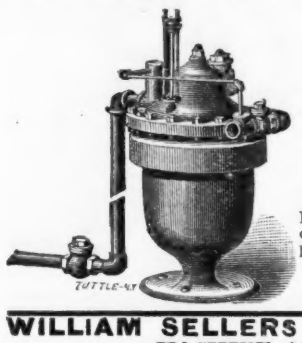

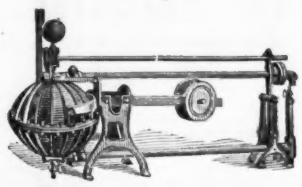

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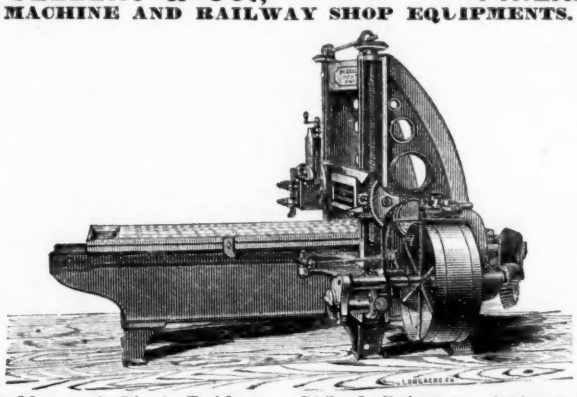

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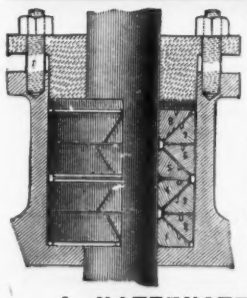

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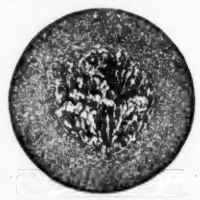

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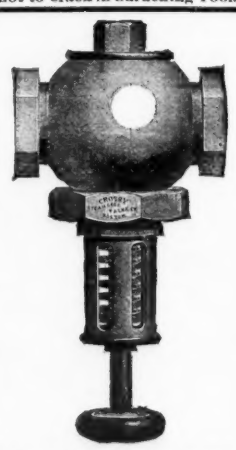

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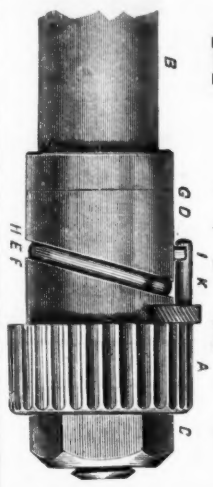

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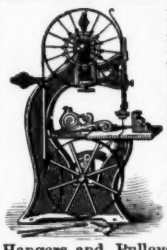

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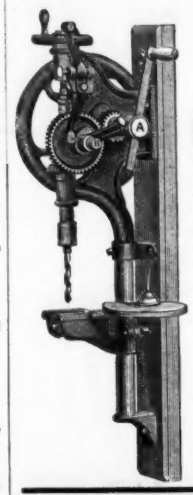

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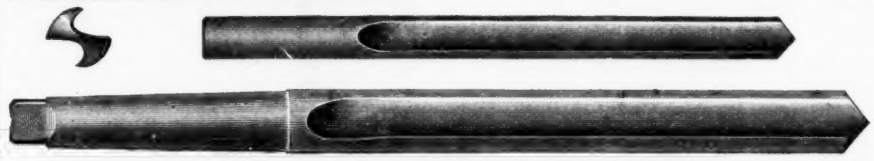

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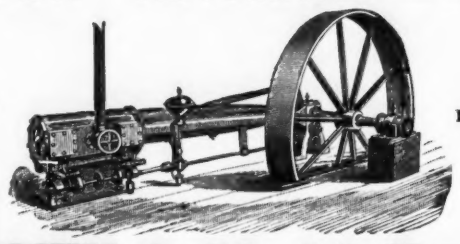

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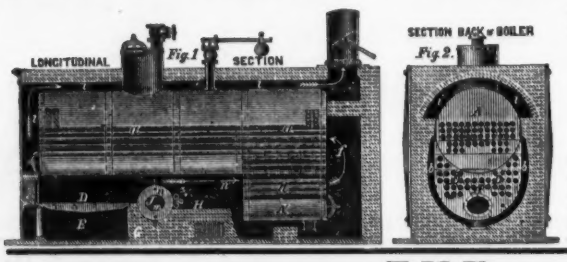

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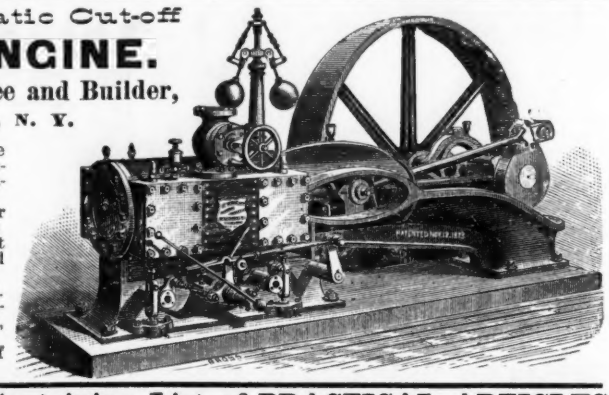

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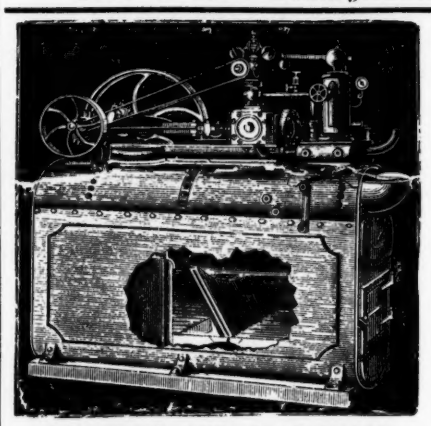

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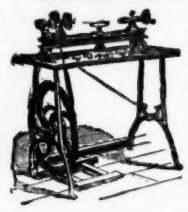

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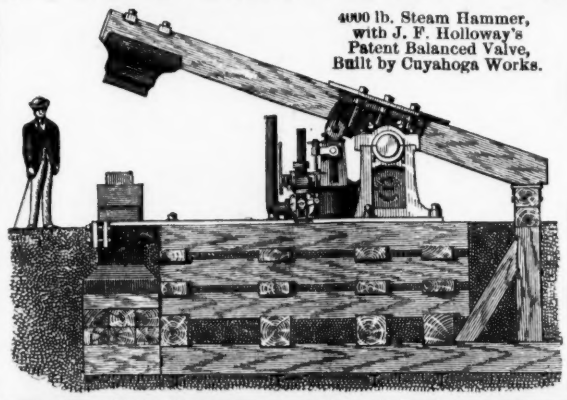

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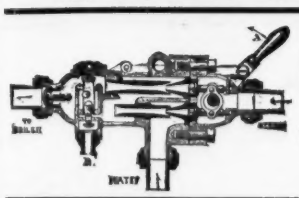

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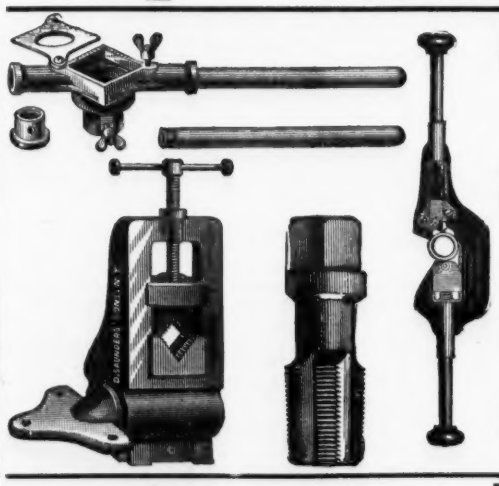

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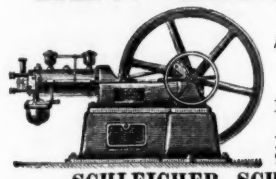

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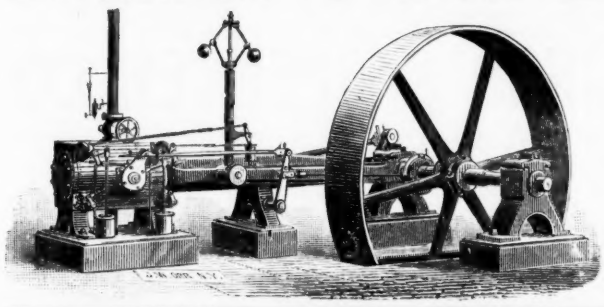

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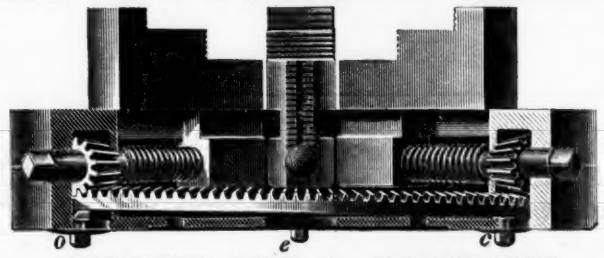

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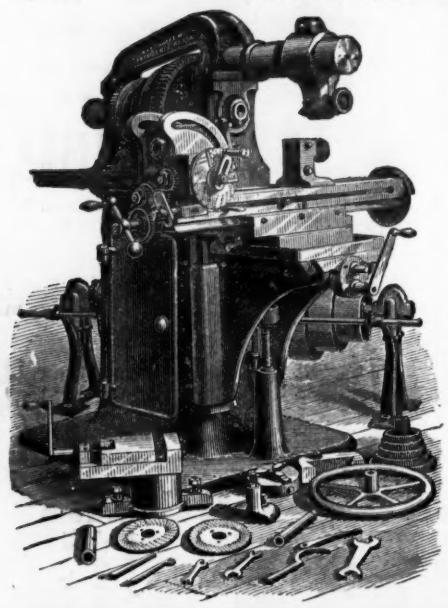

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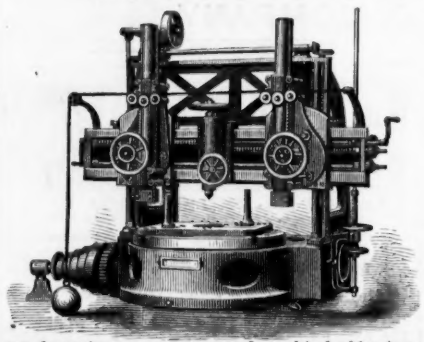

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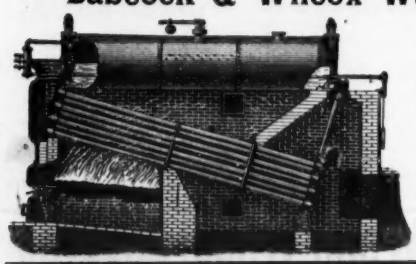

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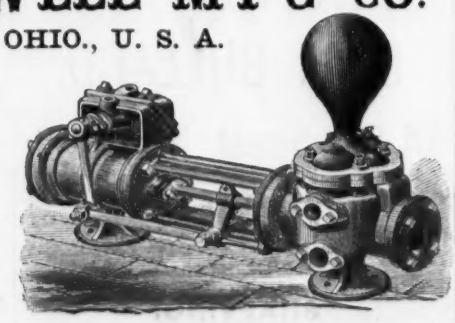

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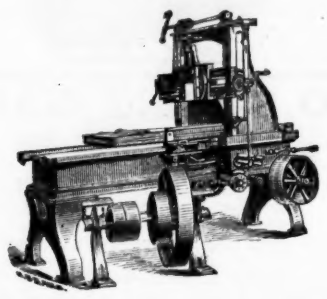

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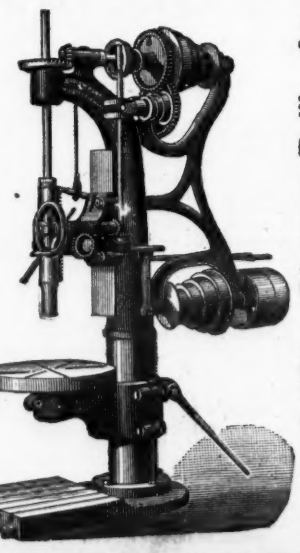

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